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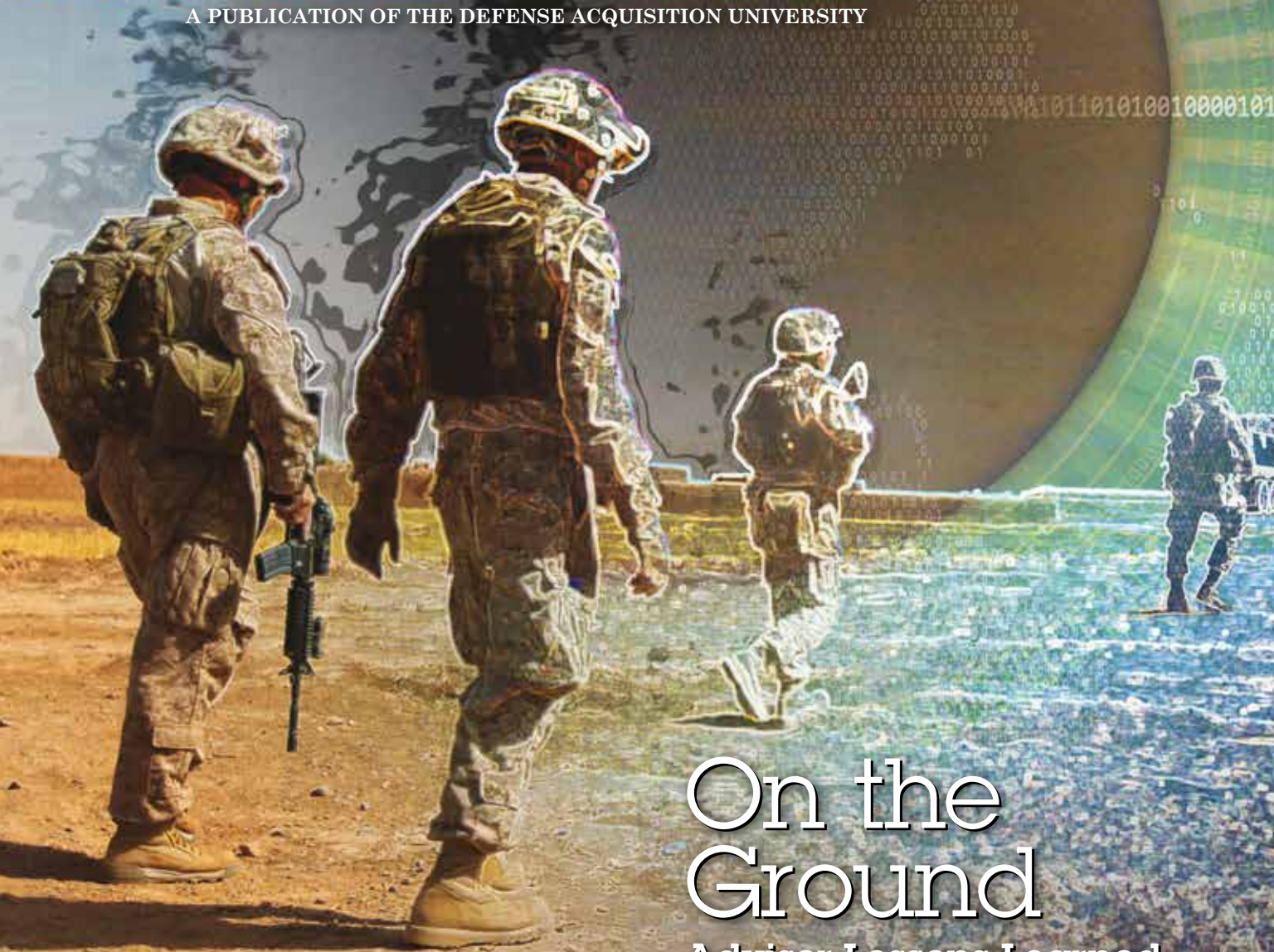


Defense

AT&L

Acquisition, Technology and Logistics

A PUBLICATION OF THE DEFENSE ACQUISITION UNIVERSITY



On the Ground

Advisor Lessons Learned

Our Relationship with Industry
by the Under Secretary of Defense (AT&L)

**Scheduling
and SVTs**

**Naval Aviation
Costs**

**Alternatives
for Success**

CONTENTS



2

From the Under Secretary of Defense for Acquisition, Technology and Logistics

Our Relationship with Industry

Frank Kendall

6



On the Ground

Advisor Lessons Learned

Stephen A. Mackey

In the struggle to secure Afghanistan against terror, the U.S. has moved to an applied logistics problem.

10



Scheduling and SVTs

Rx for Efficiency

Lynnetta Babuchiwski, Matthew Wilkinson, Kelli Coon, Mike Kotzian, and Duane Mallicoat

The relevance of the adage "time is money" is clear in acquisition programs. A program's health continually is assessed across four interdependent factors: cost, schedule, performance and risk.

17



Naval Aviation Costs

Targeting Operations and Support

Capt. Robert Farmer, Capt. Keith Nixon, Capt. Brian Jacobs, Cmdr. Craig Owen, Aubrey Dennis, Michael Berkin, Roy Lancaster, Tim Simpson, and Duane Mallicoat

Affordability is as important as performance in assessing weapon systems—and that is most important in sustainment, where 70 percent of a program's life-cycle costs are borne.

23



Alternatives for Success

One Program's Unconventional Structure

Maj. Christopher P. Hill

Program managers must determine the best way to incorporate the Better Buying Power 2.0 philosophy and design program structures to "optimize the potential for success."

28



Where Sustainment Meets Deployed Forces

Do You Really Know Who's Going to Maintain Your Aircraft and Where It's Going to be Maintained?

CDR Mark Nieto, Ann Wood Mike Kotzian, and Duane Mallicoat

How can one plan to maintain aircraft in the myriad environments, cultures and geographically dispersed locations where maintenance actually occurs?

34



Cybersecurity

Defending the New Battlefield

Steven J. Hutchison, Ph.D.

Cybersecurity is one of the most important challenges facing our military today. Cyberspace is a new warfighting domain, which includes almost all major defense acquisition programs.

40



Digital Pentagon

Pete Modigliani

In the face of an increasingly complex operational environment and decreasing defense budget, it is time for a radically new Pentagon approach for the Digital Age.

44



The Virtual PM

Robert L. Weinhold

The era of the Virtual PM is alive and well in an age of cellphones, Blackberries, e-mail, conference calls, flextime and flex place. The project manager no longer can always schedule face-to-face weekly team meetings and must adapt.

50



Stakeholder Needs and Expectations Planning Your Agile Project and Program Metrics

William A. Broadus III

A key element in the success of any program is the ability to communicate progress against a baseline of cost, schedule and technical performance within and outside the team.

55



Risk in Fixed-Price Contracts

David E. Frick, DBA

Shifting risk to the vendor may not always provide the best outcome in the real environment of uncertainty that surrounds many government contracts.

58



Time Management Tips

For Those Who Don't Have the Time

Roy Wood, Ph.D.

ALSO

4

MDAP/MAIS Program Manager
Changes

48

Statement of Ownership



Defense

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Our Relationship with Industry

Frank Kendall

As we enter what promises to be a difficult time for both defense acquisition professionals and the industrial base that we rely upon, I thought it might be useful to share a few thoughts on our relationship with industry. I want to provide some basic guidance for working with our industry partners at any time, but especially when those firms we depend on are experiencing a declining market, as they are now.

At any time, we need to be aware of industry's perspective if we are going to work effectively together. I left government in 1994 after a career in uniform and as a civil servant. One of the

reasons I left was that I felt I needed some time in industry to round out my background. I spent about 15 years in industry, some of it with major defense corporations, some of it as a private consultant working with defense firms of various sizes, and some of it as a partner in a small business working with defense companies ranging from start-ups to major corporations. Many, probably most, Department of Defense (DoD) acquisition people have not worked in industry and have not experienced that perspective firsthand.

Industry's perspective is pretty straightforward. One of the things I enjoyed about industry was that there was never any confusion or disagreement about the metric we used to measure our own performance. In short, we were trying to make money: If certain actions made us more money, they were considered good; if they made us less money, they were not good. That's an oversimplification, of course. In actuality, the equation for industry is much more complex than this




would suggest, but in the long run the principle I just articulated governs. If a firm is going to stay in business, profit is required. It doesn't stop there; business leaders also have an obligation to their shareholders to maximize the return the company achieves.

Our fundamental obligation, on the other hand, is to obtain as much value as we can for our warfighters and the American taxpayer. Industry's goal and ours would appear to be in tension, and to a degree they are. We are not, however, in a purely adversarial relationship with industry. Neither are we in one with completely common interests. As we try to maximize the value we receive from industry, we also have an obligation to treat industry fairly and reasonably. Here are some thoughts about how we should behave in this complex relationship:

1 Give industry the opportunity to make a reasonable profit. How much is "reasonable" is subject to some disagreement, but generally it should be commensurate with the risks being accepted by industry and with the rate of return a going concern doing similar work would obtain in a free market. As I indicated above, profit isn't optional for a business, and firms won't support the DoD unless they have the opportunity to make an acceptable return.

2 Don't ask companies to take on more risk than they can absorb. Defense firms generally will respond to any Request for Proposals (RFPs) the department puts out for bid that they think they have a shot at winning. We in government need to understand the risks associated with the performance we are asking for and structure the business deal so risk is allocated reasonably between the government and industry. This issue tends to dominate the decision between a fixed-price and a cost-plus contract vehicle. Firms can absorb some risk, but that capacity is limited. Before we can set the boundaries and terms of a business deal, we need to understand both the magnitude of the risk involved in providing a product or service successfully and a company's capacity to absorb risk.

3 Tie profitability to performance. Profit is not an entitlement; it should be earned. Our industry partners tend to be smart people. If we give industry a financial incentive to provide the department with better services, or a better product, or anything else that we value, and if we structure that reward so it is attainable with reasonable effort, then we can expect to see the behavior we have motivated. In some business deals, this incentive is built in. A fixed-price contract always rewards effective cost control by the supplier, but the government may not share in that reward—unless we structure the contract so that we do. Incentives can and should cut both ways; poor performance should lead to poor returns. In



**As we try to maximize
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fairly and reasonably.**

general, I believe we can be more creative and more effective at structuring incentives that tie profit to performance. By doing so, we can create win-win opportunities for industry and government that reward the results that provide value for the warfighter and the taxpayer.

4 Don't ask industry to make investments without the opportunity for a reasonable return. On occasion, I have seen government managers solicit or encourage investments from industry without a realistic prospect of a return on that investment. This can take several forms: internal research and development spending, participation in government-sponsored but unfunded demonstrations, development of proposals or option bids when there is no serious prospect of future business, or cost sharing in a technology project that isn't going to lead anywhere. This kind of behavior often occurs as part of an effort to obtain more support for a program that is on the margins within a Service's budget. Putting industry in this position is not fair to industry, and it wastes resources that could have been used more productively. It also destroys trust between industry and government when promised business opportunities do not materialize.

5 Communicate as fully with industry as the rules allow. For some reason, we seem to have become "gun shy" about talking to industry. That's the wrong approach. The more we communicate our intent and priorities to industry, and the more we listen to industry concerns, the better. Up until the time a final RFP for a specific effort is released to industry, we should not overly restrict our contacts. We do have an obligation to treat all firms in the same manner—but that doesn't mean we can't have conversations with individual firms, as long as the same opportunity is available to others who want to take advantage of it. We can expect that a lot of what we hear from companies will be self-serving. At the same time, however, companies may have legitimate concerns about how we are doing business and superior ideas about how to acquire

the product or service we are contemplating. We need to be as open as we can be, and we need to listen.

6 Competition works—use it whenever you can. The wonderful thing about competition is that it is a self-policing mechanism. Companies are motivated to do whatever they can to reduce cost and provide a better product or service in order to win business. We also generally can rely on industry to protect itself and only sign a business deal that delivers an acceptable profit, or at least does so within the firm's risk tolerance and consistent with any broader business situation.

7 Treat industry fairly, and keep your word. It is interesting that the commercial world has no requirement for one firm to treat another fairly. (Try to imagine a "protest" of a commercial contract award because the buyer's source selection process wasn't equally fair to all possible bidders.) Because we are an arm of the U.S. government and we expend public funds, we are held to that standard. It's also the right thing to do ethically, and it is necessary if we want to have constructive relationships with industry. My experience is that industry does not entirely trust government people. Our source selections are opaque to industry, and no industry capture-team leader ever told his boss that he lost because he wrote a bad proposal. If we act just once in a way that is not consistent with our values or betrays a commitment we have

made, then we have sacrificed whatever trust we have built. We can spend our credibility only once and then it is gone.

8 Protect the government's interests and insist on value for the taxpayer's money. I put this last for a reason. This is the other side of the coin. Industry can be counted on to try to maximize the metric that I mentioned, profitability. Most of the time, but not always, industry will do so within the "rules of the game." The "rules of the game" are defined largely by law and by the terms of the contracts we sign. The business deals codified by our contracts have to be fair, but they also have to be structured so that the government obtains what it wants at a reasonable price and industry is motivated to improve its productivity. Once we have the business deal in place, we have to ensure that the product or service we've acquired is delivered as agreed. If not, we have a duty to act to protect the warfighter's and the taxpayer's interests.

Nothing I've written here should be a surprise. These are principles we should all be very familiar with already. As we continue, at least for the next few months, or maybe years, to experience shrinking budgets and environments that place great stress on both DoD and industry, I believe we should make a special effort to keep them in mind. Like everything else we do, this requires a deep understanding of the products and services we are acquiring, of the business deals we enter and of the industry partners with which we do business. &

MDAP/MAIS Program Manager Changes

With the assistance of the Office of the Secretary of Defense, *Defense AT&L* magazine publishes the names of incoming and outgoing program managers for major defense acquisition programs (MDAPs) and major automated information system (MAIS) programs. This announcement lists such changes of leadership, for both civilian and military program managers for the months of July and August 2013.

Army

Col. Willie D. Coleman relieved **Col. John S. Turner** as project manager for Combat Ammunition Systems-Indirect Fire (CAS-IF) Project Office in July.

Col. Harry R. Culclasure relieved **Col. Thomas P. Flanders** as project manager for Army Enterprise Systems Integration Program (AESIP) in July.

Col. John M. Eggert relieved **Darryl Colvin** as project manager for Lower Tier Project Office in July.

Navy/Marine Corps

Col. Dan Robinson relieved **Col. Gregory Masiello** as program manager for the V22 Osprey Joint Program Office (PMA 275) in July.

Capt. Mark Glover relieved **Vincent A. Squitieri** as program manager for the Navy Multiband Terminal (NMT) (PMW 170) in August.

Air Force

Col. James Echols relieved **Col. Michael Gregg** as the C-5 Systems program manager on July 22.

Yvette S. Weber relieved **Kathryn J. Sowers** as the program manager for the C-5 Reliability Enhancement & Re-engineering Program (RERP) on July 14.

Anthony E. Zompetti relieved **Edwin P. McDermott** as the program manager for the C-130 Hercules Program (C-130J) on July 8.



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Join the best minds in science and technology on DoDTechipedia—the new internal wiki for the U.S. Department of Defense. Post ideas, ask questions, make suggestions, or share information with colleagues you can't reach now. It's a way to expand our brainpower, focusing on rapidly responding to the needs of the warfighter.

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- **Share your knowledge.** Every contribution counts. The more you contribute, the more the collective knowledge base expands. The wiki can easily be edited by any user, broadening your access to the latest and best research and ideas. DoDTechipedia is open to federal government employees and contractors with Common Access Card or DTIC registration.
- **Connect across walls.** Reach across command chains and departmental divisions to find other people working on ideas and solutions that interest you. Discuss hot topics. Stay on top of new trends. Read technical blogs—or create one of your own. You don't need to know the right people—you can connect on the wiki.
- **Collaborate.** The wars we are fighting today require immediate solutions. The wiki is the biggest brainstorming session ever at DoD. Network with others working in your areas of interest. Present new ideas or technical challenges. Stay abreast of research and development initiatives, conferences, and symposia. Collaboration across DoD increases our ability to identify challenges as they emerge and deliver vigorous solutions fast.



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Information Assurance:
Protection and defense of information and IT systems

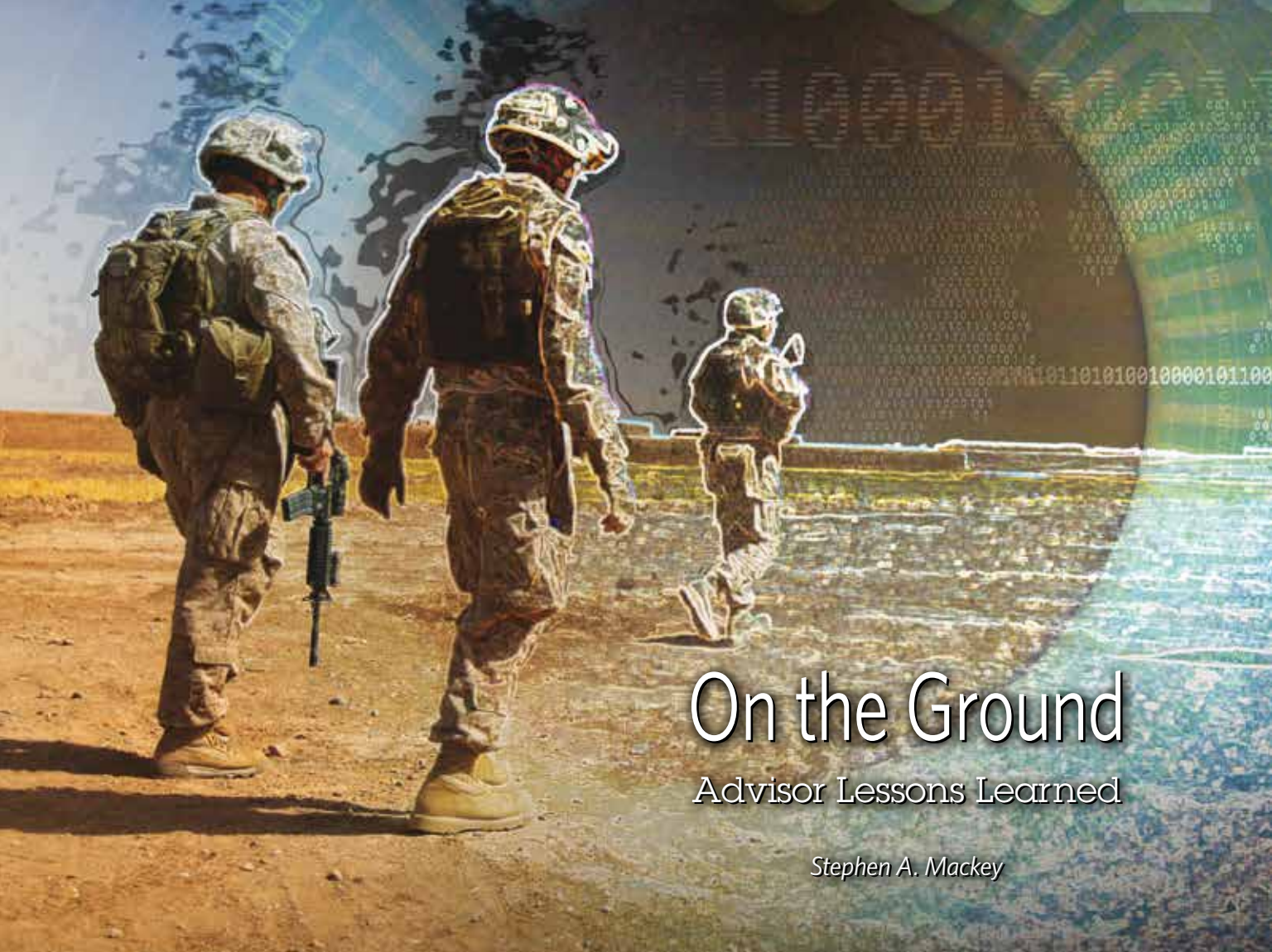
Information Warfare:
Capabilities used to exploit information and IT systems

Networking Technology:
Technologies that interconnect groups and/or systems

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The U.S. Department of Defense Science and Technology Wiki

A project of Acquisition, Technology and Logistics, Defense Research and Engineering, Defense Technical Information Center, Networks and Information Integration and Department of Defense Chief Information Officer, and Rapid Reaction Technology Office



On the Ground

Advisor Lessons Learned

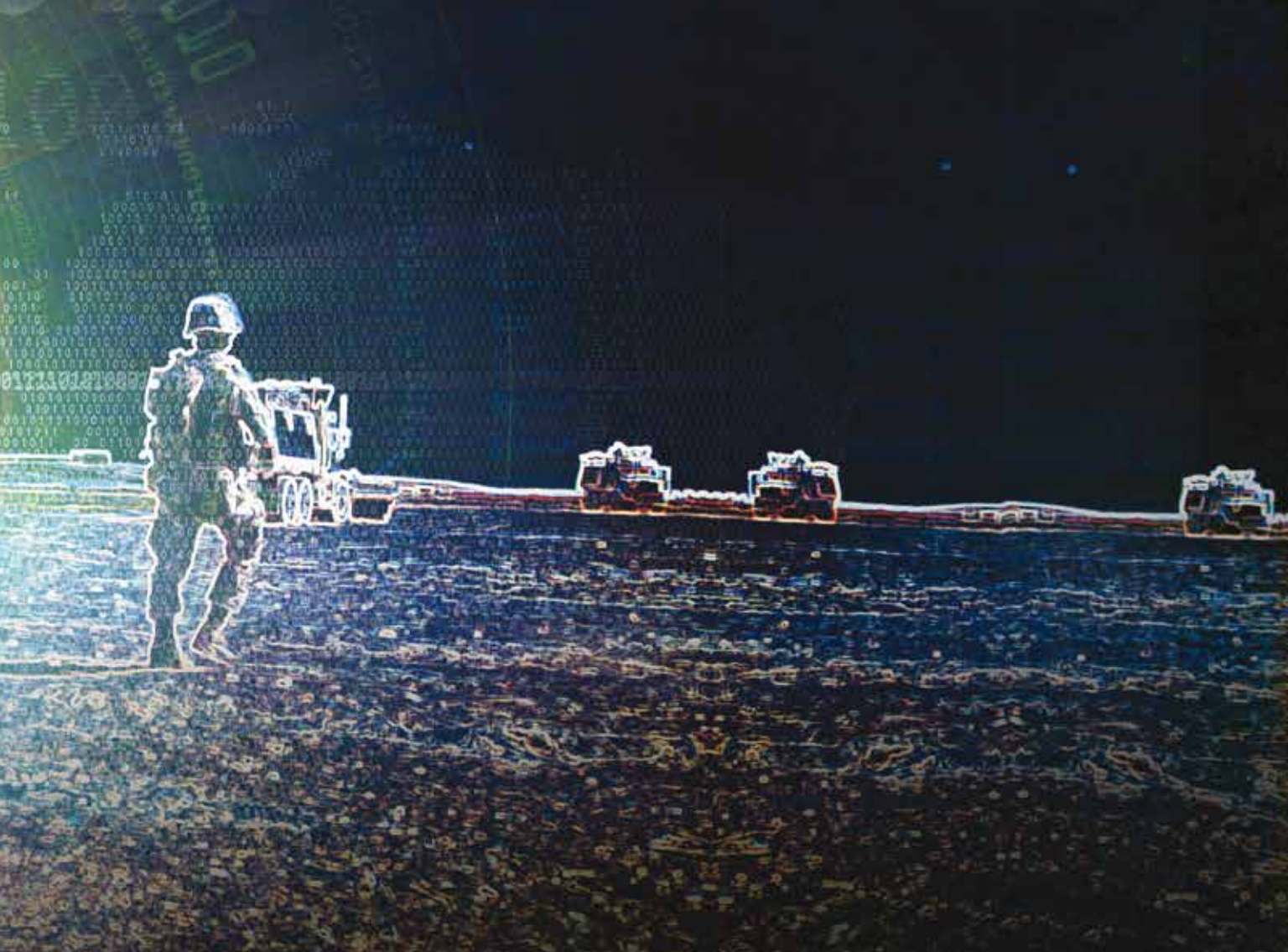
Stephen A. Mackey

As the United States enters its 12th year in Afghanistan, the focus has moved from putting pins on maps and kinetic action to an applied logistics problem.

The U.S. national interest is for a stable Afghanistan that will not be made a hostage state for terror. Achieving this end now is up to the Government of the Islamic Republic of Afghanistan. In the forefront are the Afghan National Security Forces (ANSF—Ministry of Defense [MoD], Ministry of Interior [MoI], and National Defense Service). These forces have made great progress over the past decade and now are managing the battle space of the vast majority of Afghanistan. Under the tutelage of the United States and its coalition partners, the fighting prowess of the ANSF at the tactical level matured greatly over the past decade. Largely neglected until just recently has been the development of the capacities and structures required to sustain this force in the field. Ministerial development of both the MoD and MoI has drawn increased senior coalition leadership attention. This renewed interest provides an unprecedented opportunity to financial, logistical and acquisition professionals.

The MoD Advisory (MoDA) program allows selected DoD professionals to serve within the security ministries as advisors. Managed by the Defense Security Cooperation Agency, the MoDA program provides

Mackey just completed a yearlong tour as the senior advisor to the First Deputy Minister of Defense in Afghanistan. Mr. Mackey previously was the Director for Operations in the Immediate Office of the Under Secretary of Defense for Acquisition, Technology and Logistics for the Honorable Ken Krieg and John Young.



formal classroom and field training and then sends successful graduates to Afghanistan to serve as advisors. Deputy Secretary of Defense Dr. Ashton Carter emphasized the importance of the advisory effort in Afghanistan in an April 27 memo. Carter prodded Commands to encourage qualified candidates to apply for positions in Afghanistan and then went further to describe now as a critical time in the fight in Afghanistan. Having just spent a year on the ground in Afghanistan, I heartily agree with Carter's assessment—now is a critical time.

On arrival in Afghanistan, advisors are immersed in the security ministries and have daily contact with their Afghan counterparts. This provides the opportunity to coach and mentor Afghan leaders at all levels. Duty as an advisor is a rare opportunity and one from which an individual will emerge as a more technically skilled professional, leader and person. Below is a short summary of the learning and growth opportunities of my year as

the senior advisor to the First Deputy Minister of Defense in Afghanistan.

Education on National Security

The insurgency in Afghanistan is caused by many factors. Some are domestic, but the Afghans assert the real driver of the insurgency is interference by Afghanistan's neighbors, some of them allied with the United States. Spending a year in the office of the senior civilian in the Afghan MoD allowed me to learn, and then contribute to the development of Afghan National Security strategy. After a brief orientation to the facts and assumptions, I was called upon to participate and in some cases lead senior leader discussions about threats and opportunities as they relate to Afghan national interests. This allowed me to apply my formal training from the National War College and the 6 years I spent in the Pentagon's E-Ring in a real-life setting—an opportunity history seldom presents. Compounding the difficulty of this analysis was that in some cases Afghan national

interest runs counter to that of the United States. As such, I was required to do national security analysis from both the Afghan and U.S. perspectives and educate my Afghan mentee on the common ground between the two. This impacts mid- to long-term decisions of how the Afghan National Army and the Afghan National Police forces are equipped and operate. A sterile strategic assessment of regional threats would lead to a one-force composition; the reality of what the United States will pay for is another.


Education on the Planning, Programming, Budgeting and Execution (PPBE) Process

The MoD's planning systems are modeled on those of the U.S. Department of Defense (DoD). For the first 9 years of the MoD's existence, the planning system was largely dormant; the United States and the coalition provided all feeding, equipping and sustaining of the growing force. Only in the past

logistics delivery system. The Afghans' self-interest makes them very receptive to coaching in all areas. No better arena exists for an acquisition professional to gain a deeper understanding of acquisition craft than a year serving as an advisor in Afghanistan.

Budget

Afghan senior leaders are hungry for solutions in budget planning and execution. Current MoD budget efforts are stovepiped and lack transparency. This is caused by training shortfalls, petty squabbles among senior leaders and a tacit acceptance of a certain level of corruption. Senior Afghan leadership recognizes lack of transparency may stop the continued stream of coalition funding and has felt it necessary therefore to address financial management head on. This budget year (Fiscal Year [FY] 1392 [Islamic Calendar vs. AD 2013]) they installed simple but effective tools to measure



The advisor needs to slowly and methodically advance the argument for the proposed way ahead and elicit their mentees' support. This "managing up" leadership has utility in environments other than Afghanistan.

year have the Afghans been forced by necessity to analyze the threats and derive required capabilities to address them. This has forced their programming and budgeting processes, as well the procurement and acquisition systems, to work at breakneck pace. Additionally, the planning cycle is severely truncated in time and the force is relatively small. This allows advisors to track a concept from idea to budgeting to actual capability delivery in a way impossible in the DoD due to its large size and long planning horizons. This has given me insight and understanding of the PPBE planning process not obtainable in the DoD.

Immature Acquisition System

Only recently has the Afghan MoD been required to provide a wide array of goods and services to the force. As such, the system is very immature. Additionally, the system we created for them lacks many of the flexibilities we enjoy in the U.S. system. Concepts like Indefinite Quantity Indefinite Delivery (IDIQ) and Blanket Purchase Agreements are new to the Afghans. Serving as an advisor in the acquisition community provides real opportunities to shape an evolving system. And the small size of the organization allows an advisor in the acquisition community to be exposed to and help shape many portions of the process. From pricing to source selection to contract award, advisors have ample chances to provide meaningful input into the process. The Afghans recognize the United States no longer will manage the end-to-end acquisition and

budget execution and used the data to make decisions informed by data. Specifically, they coordinated and executed a midyear reprogram action of more than 11 percent (\$126 million) of the FY 1392 budget. This reprogram was spurred on by advisors and senior coalitional leaders forcing the Afghans to grasp the reality that endless streams of money and material support were things of the past.

Reacting to this reality, the Afghan MoD now compiles a very basic unfunded requirements (UFR) list, a forward planning concept foreign to them until just recently. Armed with this UFR list, they can more intelligently solicit aid during bilateral discussions and now have a systematic way to spend end-of-year funds that may become available due to spasmodic funding from across the coalition. Finally, they have begun to look hard at the structural model we provided for planning and spending to determine if it is appropriate for a force their size. Financial management has drawn significant senior command interest and provides a financial professional the opportunity to expand and challenge their financial capabilities.

Leadership

Advisors work alongside Afghan counterparts daily. In many cases, the advisor is significantly junior in rank to those advised. This requires a very different sort of leadership. Specifically, the advisor needs to slowly and methodically advance the argument for the proposed way ahead and elicit their mentees'



Above: Newly arrived vehicles awaiting inspection and delivery to Afghan end users. Photo taken at the MoI Material Command, Kabul.



Left: Warehouse at the National Logistics Center in Afghanistan.

for money to buy a pool at a training facility, I would steer the discussion to the Unfunded Requirement list. In this way, they got what they thought they needed and developed staff capacity along the way.

Conclusion

Serving as an advisor in a joint-combined-coalition-interagency combat environment is a rare opportunity from which one cannot help but draw lessons. The days are long, the conditions far from opulent, but the sense of accomplishment and the camaraderie at the end of the day make the sacrifices well worth it. The stated pillars of MoDA training are humility, compassion and respect. Working with senior leaders of the Afghan MoD gave me ample opportunity to refine these traits.

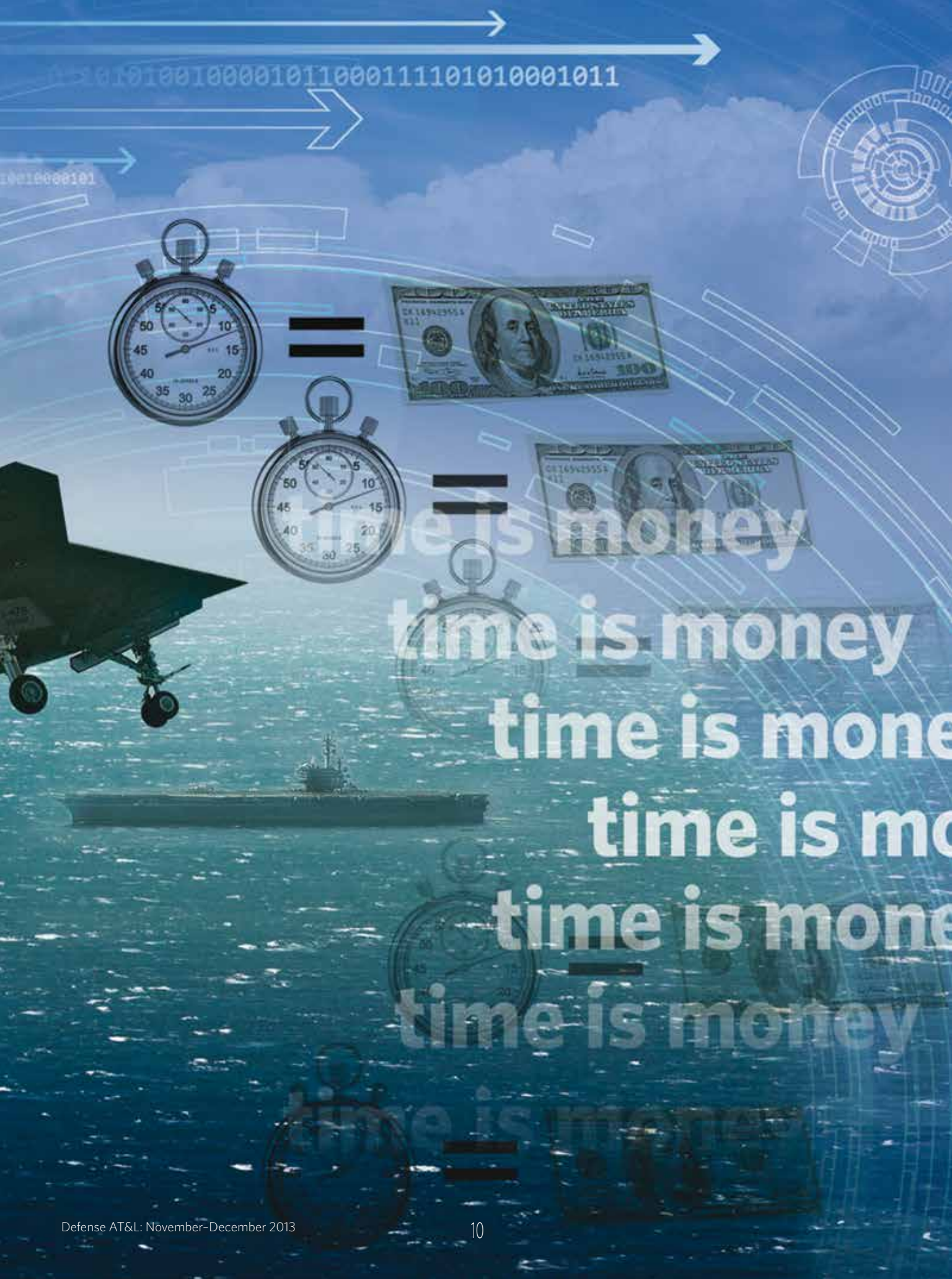
Loss of an employee for more than a year is a bitter pill for organizations to swallow. However, a year spent in a complex, challenging environment working on time-pressing matters within their respective disciplines provides organizations a matured person with a host of new skills. I strongly recommend that organizations support the MoDA program and encourage their best and brightest leaders to volunteer for the assignment. The end state the United States seeks is an Afghan National Security Force with the capacity to support a 350,000-person military engaged in an active counter insurgency campaign. Failure of this mission could allow Afghanistan to again become the haven of terrorism from which were launched attacks on London, Madrid, New York and other targets. Clearly, this is a fight the United States can't afford to lose. &

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support. This "managing up" leadership has utility in environments other than Afghanistan. Additionally, I was assigned to the Ministry of Defense Advisor Group. This group of more than 200 coalition military, government civilians, contractors and local hires provided ample opportunities to hone leadership skills. Finally, working in uncomfortable, close quarters with people of diverse backgrounds and cultures inevitably results in friction and conflict. One of my takeaways was an improved ability to cut through the superficial issues, keep the parties talking and focus all on common goals and objectives. I have been in leadership roles for the past 28 years. My skills as a leader have grown more in this year than in any other period.

Communication and Negotiation Skills

In Afghanistan, decisions are the product of a complex calculus that includes tribal and political ties, past history of conflict, and most of all, the flow of illicit money. Perhaps the greatest takeaway from my tour has been to look past what people are saying and understand the issue from the basis of what motivates them. This understanding allows one to drive the decision to meet both Afghan and coalition needs. The Afghans have been conditioned to solicit tactical, logistical, and financial victories from the coalition over the past decade. Recognizing this, I developed key themes and messages that allowed me to redirect questions into one of several strategic storylines. Simply put, if the Afghans asked



Scheduling and SVTs

Rx for Efficiency

Lynnetta Babuchiwski ■ Matthew Wilkinson
Kelli Coon ■ Mike Kotzian ■ Duane Mallicoat

Even though Benjamin Franklin first voiced this well-known adage in the 1700s, the message remains relevant in today's time of increased program scrutiny. For acquisition programs, the relevancy is clear as a program's "health" is assessed continually across four interdependent factors: cost, schedule, performance and risk. In the context of Franklin's adage, a program office measures "time" through the schedule factor.

A Time of Increased Focus

While scheduling has been a foundational factor for program evaluation, a series of new initiatives over the past several years has brought scheduling to the forefront of defense acquisition.

In September 2010, the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (OUSD[AT&L]) released its Better Buying Power (BBP) guidance that outlined "twenty three principal actions to improve efficiency." One of these principal actions specifically focused on scheduling: "Set shorter program timelines and manage to them."

In April 2011, the National Defense Industrial Association published the *Planning & Scheduling Excellence Guide v2.0* (PASEG), which laid the foundation for Generally Accepted Scheduling Principles (GASP)—eight overarching tenets for building, maintaining and using schedules as effective management tools.

In May 2012, the Government Accountability Office (GAO) published its *GAO Schedule Assessment Guide: Best Practices for Project Schedules* (GAO-12-120G), defining the top 10 best practices to follow in scheduling. In July 2012, the Office of Performance Assessments and

An X-47B Unmanned Combat Air System (UCAS) demonstrator flies near the aircraft carrier USS George H.W. Bush (CVN 77), the first aircraft carrier to successfully catapult launch an unmanned aircraft from its flight deck.
U.S. Navy photo by Erik Hildebrandt.

Babuchiwski is the PMA-268 Operations Deputy; **Wilkinson** is the PMA-268 Integrated Government Scheduler; **Coon** is an analyst at the Bureau of the Fiscal Service, U.S. Department of the Treasury; **Kotzian** is the Defense Acquisition University's Mid-Atlantic Acquisition/Program Management Department Chair; and **Mallicoat** is the DAU Mid-Atlantic Region Associate Dean for Outreach and Mission Assistance.

An X-47B Unmanned Combat Air System (UCAS) demonstrator completes an arrested landing on the flight deck of the aircraft carrier USS George H.W. Bush (CVN 77). The landing marks the first time any unmanned aircraft has completed an arrested landing at sea. U.S. Navy photo by MC3 Kevin J. Steinberg.



Root Cause Analysis (PARCA) within OUSD(AT&L) released a new Integrated Program Management Report Data Item Description (IPMR DID) for future contract awards over \$20 million. This new DID replaced the previously separate DIDs for Contract Performance Report (CPR) and Integrated Master Schedule (IMS). While contracts meeting Earned Value Management (EVM) thresholds generally contained the CPR DID, the IMS DID sometimes was forgotten in the rush to award a contract. To ensure the vital IMS is included, the IPMR DID combined the two.

So, why is there an increased focus on scheduling? Simply put, scheduling considers all aspects of a project for appropriate evaluation during planning and execution. As with any complex endeavor, a systematic approach is the best way to capture all aspects. Think of how the process-oriented systems-engineering approach became a cornerstone of DoD Instruction 5000.02 (*Operation of the Defense Acquisition System*) dated Dec. 8, 2008. The ability to follow a well-understood and consistent approach reduces the risk of failure and gives confidence to the team by identifying a clear path forward from which a program can manage expectations successfully. Incorporating a systematic approach to scheduling provides similar benefits. Programs that do not manage to timelines established through a systematic process often result in substantial cost growth and late delivery to the warfighter.

Substantial DoD budgets over the last decade may have allowed programs to recover more easily from schedule impacts, but such is not the case in today's fiscal environment of decreasing budgets and increased attention to program progress and affordability.

Scheduling Premise

A schedule is essential for government acquisition programs because it provides a roadmap for systematic project execution. Additionally, a schedule is the main source to measure program progress; it quickly identifies and resolves potential program timing issues and ensures accountability at all levels. It provides a time sequence for the duration of all program activities and aids in the understanding of those activities that drive the schedule. Using the schedule, everyone understands when the major milestones will occur. If the program requires EVM, then a program schedule also is a vehicle for developing a time-phased budget baseline. Furthermore, it is an indispensable basis for managing tradeoffs between cost, schedule, performance and risk. Program management can compare possible sequences of activities, determine how resource availability affects the work, identify contingency plans to mitigate risk and predict the consequences of managerial action or inaction on events. Inevitably, program changes occur, and a systematically developed and managed schedule can forecast the effects of delayed, deleted and added scope, as well as opportunities for recovery. In this manner, schedules can verify and validate the impact of proposed modifications against the planned time to complete. A program simply cannot be successful without an integrated and reliable schedule that defines when and how long work will occur, and how each activity relates to the others.

Typically, two simultaneously developed program schedules gain the most visibility: the prime contractor's IMS and the government's integrated government schedule (IGS). They are built from different perspectives and reflect different priorities



Unmanned Combat Air System (UCAS) demonstrator launches from the aircraft carrier USS George H.W. Bush (CVN 77) after completing its first arrested landing on the flight deck of an aircraft carrier. U.S. Navy photo by MC3 Christopher A. Liaghat.

and details. Whereas the prime contractor develops and manages its own IMS to track milestones and activities for which the contractor is responsible and accountable, the government focuses on its tasks to ensure a successful program (e.g., contracting activities, acquisition documentation, systems' engineering processes, logistics, GFE, test and evaluation). However, both are built using standard scheduling practices, including subcontractor efforts and work breakdown structure (WBS) levels. Decomposition of the WBS to the lowest level necessary for planning and execution helps organize and define the project's total work scope—including consideration of resources, materials and time.

Challenges in Developing a Schedule

From a general scheduling perspective, many challenges are associated with developing a program schedule. While each scheduler's challenges vary, the following list, though not comprehensive, represents some common scheduling challenges.

- **Capture all activities:** Reflect all activities (steps, events, outcomes and other factors) as defined in the program's WBS.
- **Sequence all events:** Logically sequence activities in the order in which they would be executed.
- **Assign resources to all activities:** Realistically reflect resource (labor and materials) needs, and funding or time constraints.
- **Establish a realistic duration of all activities:** Reflect how long each activity will take to execute, taking care to keep from underestimating the duration of activities, especially when complex or technically challenging.

- **Establish the critical path for all activities:** The critical path (i.e., sequence of discrete tasks/activities that has the longest total duration and the least float/slack) should be identified.
- **Identify reasonable "float":** Understand the time that an activity can slip before the delay impacts contract completion or a constraint date.
- **Conduct a schedule risk analysis:** Predict the level of confidence in meeting a project's completion date, calculate the contingency time needed for a level of confidence and identify high-priority risks.
- **Update the schedule:** Use logic and durations to reflect realistic start and completion dates for project activities, and continually monitor to forecast completion dates differing from planned dates.

Alternatively, a scheduler could appreciate these scheduling challenges as "best practices." That is, programs that successfully resolve or avoid the above scheduling challenges are, in effect, implementing a best practices approach to develop a realistic, systematic program schedule.

Integrating Government and Contractor Schedules

We now expand our schedule discussion to the program office, which executes day-to-day acquisition-related activities. As almost everyone realizes, the program office is "ground zero" for formulating a program schedule. While each acquisition program office develops a program schedule, the quality of each program schedule is not necessarily the same. As stated in GAO-12-120G, "a program's success depends in part on the quality of its schedule. A well-formulated schedule can help

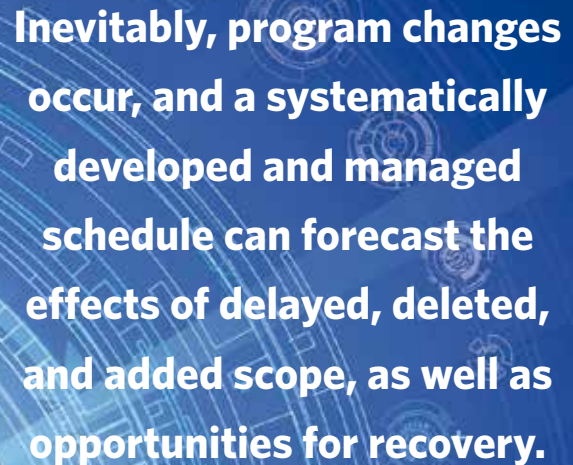
analyze how change affects the program.” Hence, simply having a program schedule is not enough. The program office must put in the effort to produce a quality schedule from the very beginning in order to use the schedule as a fundamental management tool in balancing cost, schedule, performance and risk.

As an example of a program office successfully managing schedule issues, we introduce Naval Air Systems Command’s (NAVAIR) Program Management Air (PMA)–268 program office responsible for the Navy’s Unmanned Combat Air System (UCAS) Aircraft Carrier Demonstration (UCAS-D) program. PMA-268’s mission is to mature technologies for a carrier-suitable, low observable-relevant, unmanned air system while reducing risk for carrier integration, and developing the critical data necessary to support potential follow-on acquisition programs. Northrop Grumman Corp. is the prime contractor for the X-47B air vehicle—and the government is the lead integrator for the carrier systems, the landing system and associated software and testing.

Early on, PMA-268 made the logical decision that it wanted to develop an integrated schedule incorporating the government and contractor’s work. The resultant, integrated schedule would be a foundational tool to develop the contractor’s Performance Measurement Baseline (PMB), which is a total, time-phased budget plan to measure against program performance. Budgets assigned to the scheduled control accounts and to higher-level contract WBS elements, applicable indirect budgets, and undistributed budgets form the PMB budget plan. The PMB is one of a program manager’s principal tools for measuring project performance.

PMA-268 quickly realized the challenges of integrating the government’s work and Northrop Grumman’s IMS into an overarching program IGS. To accomplish this schedule integration effort, PMA-268 utilized NAVAIR’s competency aligned organizational structure and enlisted the help of an in-house schedule expert. Matthew Wilkinson, the NAVAIR-4.2.3 (Integrated Project Management Division) schedule expert assigned to PMA-268, noted: “The most difficult aspect of developing an integrated program schedule is uniting different schedules built from different perspectives while bolstering team confidence and relevance in the overarching program schedule.”

When integrating the government and prime contractor schedules, the traditional method mostly is manual. Often a program office receives a contractor’s IMS and picks milestone dates out of that contractor’s schedule to input into the program office’s schedule. This becomes a very tedious and manual process and, often, not a true up-to-date reflection of the timeline. In the case of PMA-268, Lynnetta Babuchiwski, PMA-268 operations deputy, remarked that the integration process revealed there was a “struggle with a true, clear picture of the government schedule integrated with the contractor schedule.”



Inevitably, program changes occur, and a systematically developed and managed schedule can forecast the effects of delayed, deleted, and added scope, as well as opportunities for recovery.

Enter a technique called Schedule Visibility Tasks (SVTs).

A New Scheduling Technique

So what are SVTs? SVTs are tasks, activities or milestones in the IMS that increase management visibility and functionality of the schedule for non-PMB related items. They are specifically structured to improve visibility across, and maintain schedule accountability between, organizations with separate schedules.

SVTs are tasks with no resources assigned and are included in the IMS to characterize potential impacts to the logic-driven network. Typically, these unbudgeted tasks represent non-PMB related items such as lead time for purchased parts or government activities. Within multiple organizations with differing goals, SVTs are a very powerful tool to align schedule incentives across an integrated team with complex interrelationships. In short, SVTs clearly illustrate how to get “from here to there.”

The IPMPR DID mentioned previously stated that SVTs “shall not be used to represent any scope within the PMB. Resources cannot be assigned to SVTs, nor shall they be used to assess earned value performance. Any SVT shall be identified with the title ‘SVT.’”

So why does this matter? At first glance, this sounds like a way to pad a schedule and produce a buffer, but that is not the intent of SVTs. Following a systematic process, SVTs can be a valuable tool for both the government program office and the contractor. For PMA-268, SVTs were discussed and decided upon cooperatively, based on a “one team” approach between contractor and government. This collaborative process provided insights from both the government and contractor perspectives, emphasizing a key result of SVTs—schedule confidence with team “buy in.”

Incorporating SVTs

As a first step to incorporate SVTs into the PMA-268 IGS, Wilkinson developed a documented process for the program office to follow. This process included how the program office would maintain the established IGS baseline and provide input to the schedule, as well as the frequency of status meetings with Northrop Grumman. Once this documented process was in place, Wilkinson set forth identifying the work to go in the IGS, with the help of the program office. This required Wilkinson to understand the right questions of the program office and capture SVTs that would make a difference. This took approximately 1 month for initial grounding (e.g., capture the work and understand its associations) and 3 months to lay the work into the schedule.

The IGS contained the SVTs and the assigned durations for each, as agreed by the government and contractor in joint meetings. After initial SVT development by the government team, a face-to-face meeting at Northrop Grumman finalized the program's SVTs. As a result, everyone involved understood how the work was associated and determined clear lines of accountability. Standing weekly meetings gave the team a clear view of upcoming tasks, quick identification of issues and risks, and whether mitigation was needed.

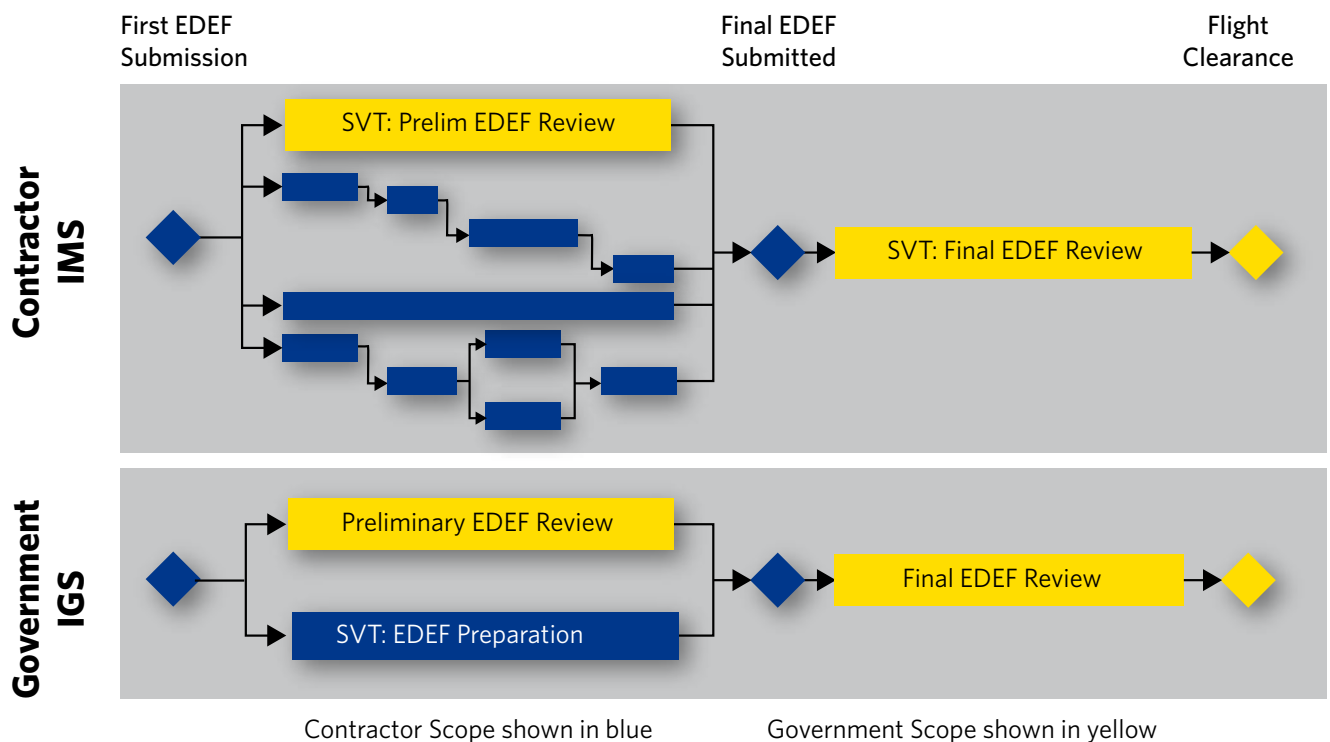
Figure 1 provides a graphic example of an SVT as part of the government's IGS. This PMA-268 example illustrates engineering documents (EDEFs) being reviewed in preparation for

a Flight Clearance. This is a large, complex process with many EDEF presentations, reviews, and back-and-forth interim submissions. In general, this tasking is too complex and dynamic to represent each EDEF in a program schedule. SVTs provide a means to manage this effort and maintain integration and proper accountability between the contractor's IMS and the government's IGS.

SVTs manage and simplify the complex back-and-forth EDEF preparation and preliminary review. In this example, the contractor prepares and submits the EDEFs (shown as blue rectangles in the IMS and reflected in the IGS as "SVT: EDEF Preparation"). With the EDEF preparation, the government concurrently is providing preliminary EDEF reviews (shown as a yellow rectangle in the IGS and reflected in the IMS as "SVT: Prelim EDEF Review").

SVTs also maintain integration and visibility. Going back to the PMA-268 example, after all EDEFs are submitted and before Flight Clearance release, the government performs "Final EDEF Review," which is reflected in the contractor's IMS to maintain visibility of the government work and promote realistic forecasting, good post-flight clearance resource management, as well as a "one team" concept with clear roles and responsibilities. However, if the final EDEF is submitted late or the review is delayed, the "SVT: Final EDEF Review" will ensure the resultant impact to the flight clearance date is made apparent to program management for mitigation.

Figure 1: Graphic Example of Schedule Visibility Tasks (SVTs)



Improved Efficiencies

With the introduction of SVTs when integrating the PMA-268 and Northrop Grumman schedules, several schedule—and program—efficiencies resulted.

The program's vision was crystalized and the overall integrated schedule was clarified, improving management efficiency within the program office. This also helped Northrop Grumman better understand the government's expectations, creating program efficiencies on the part of the contractor. SVTs helped create a picture of how everything was associated.

SVTs allowed everyone to stay focused on the work, not personalities. The SVTs enhanced communication and accountability to the teams. This modest process clarified expectations and established clear lines of accountability based on the schedule data available prior to execution.

With an established process, transition during workforce turnover was simplified and team cohesiveness strengthened. And, as a result, trust between the government and the contractor provided realistic forecasting of dates.

Summary

PMA-268's use of SVTs was critical to developing a "one team" concept between the government and the contractor. While not the only factor, SVTs helped PMA-268 and Northrop Grumman become a truly integrated team, characterized by rapid communication and personal accountability. The team's focus was on accomplishing the necessary work tasks without the finger-pointing and emotionalism that can sometimes plague a program with cost, schedule, performance and risk challenges. Capt. Jaime Engdahl, the PMA-268 program manager, summed up the benefit of incorporating SVTs into the PMA-268 scheduling process by remarking that "SVTs helped facilitate leadership at all levels, from both the government and contractor sides, to become committed to a 'one team' concept. Everyone was pulling together and clearly understood their respective role and responsibility. With a program as complex as UCAS-D, this turned out to be a huge force multiplier." &

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Naval Aviation Costs

Targeting Operations and Support

*Capt. Robert Farmer ■ Capt. Keith Nixon ■ Capt. Brian Jacobs ■ Cmdr. Craig Owen
Aubrey Dennis ■ Michael Berkin ■ Roy Lancaster ■ Tim Simpson ■ Duane Mallicoat*

When assessing the strength of today's Department of Defense (DoD) weapon systems, affordability is just as important as performance. Acquisition leadership is not focused only on determining whether a weapon system is affordable in the development and production phases but, more important, in sustainment, where 70 percent of programs' life-cycle costs are borne. History has shown that operations and support (O&S) costs

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are more likely to exceed projections than to come in under their budgeted level. Controlling and reducing weapon system sustainment has proven difficult and is quickly becoming one of Naval Aviation's top priorities.

Facing an estimated \$3.5 billion O&S funding shortfall between Fiscal Year (FY) 2013 and FY 2019, Naval Aviation must renew its emphasis on “cost-wise readiness” and develop a demanding “should cost” perspective across the Naval Aviation Enterprise (NAE). NAVAIR's Cost Analysis Team estimates it will take a 15 percent reduction in Naval Aviation O&S costs to close this gap. An effort of this magnitude must include a dynamic O&S cost reduction strategy. This article spotlights the NAE's renewed focus on reducing O&S cost through the application of proven best practices, innovative new processes and the introduction of an advanced analytical tool set across the enterprise.

**The Naval Aviation Enterprise
(The Framework)**

The Naval Aviation Enterprise is a partnership of key Naval Aviation stakeholders from the Navy and the Marine Corps. The Enterprise framework brings together the many parts that make up Naval Aviation in order to foster better decision making that benefits Naval Aviation as a whole. By partner-

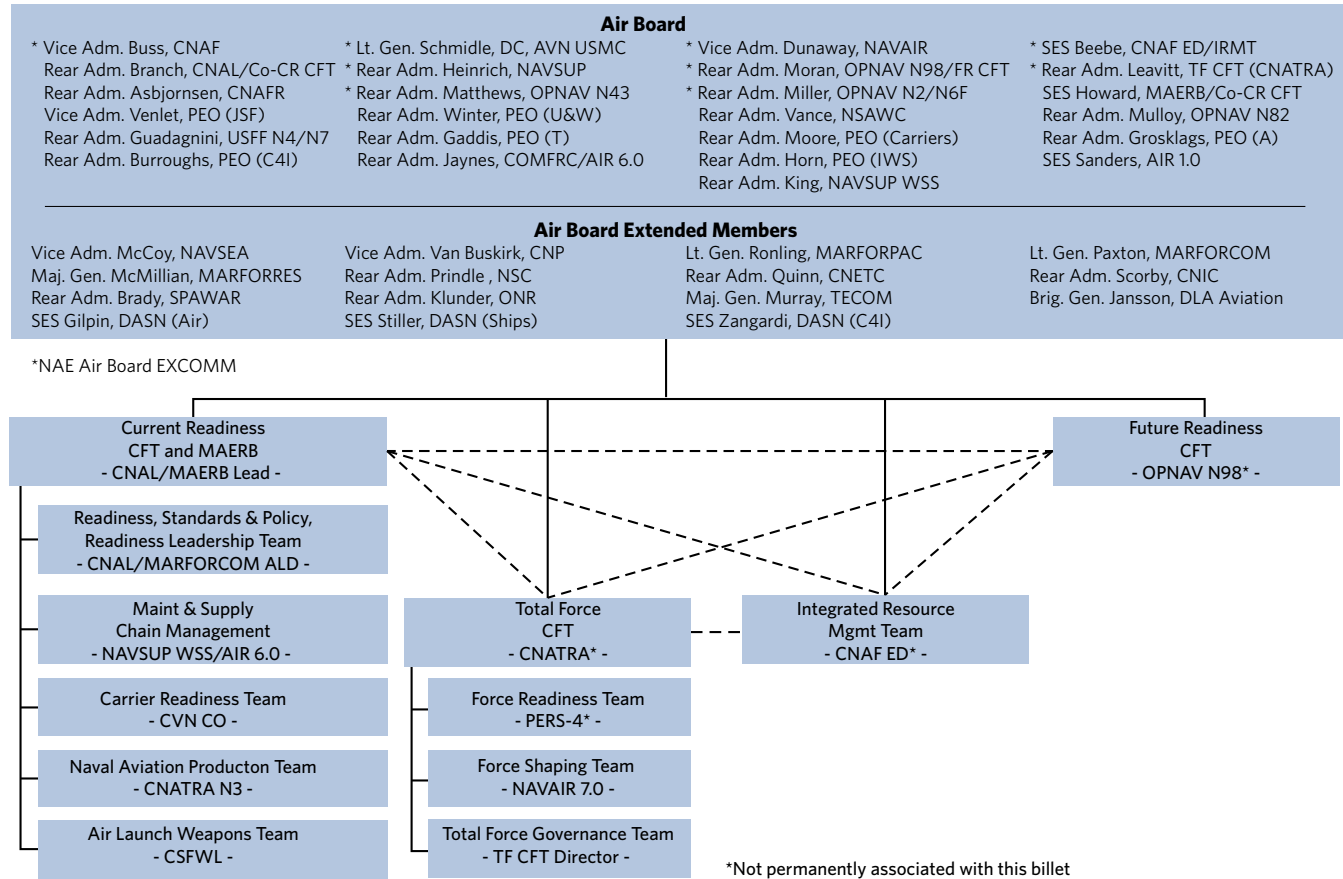
ing in a collaborative manner, Naval Aviation is better able to produce warfighting readiness in the most cost-effective way. This enterprise approach facilitates cooperation with other commands, the provider domains and other organizations that impact Naval Aviation in order to improve the alignment of resources to achieve desired levels of readiness. The goal is an integrated approach to maximize readiness and efficiencies.

Through this alignment of the myriad organizations that impact Naval Aviation, the NAE is able to perform its stated mission: advance and sustain Naval Aviation warfighting capabilities at an affordable cost ... today and in the future.

Naval Aviation Enterprise approach is based on the following principles:

- **Consistent cross-functional process thinking.** Working horizontally across organizations, an enterprise can achieve desired results more effectively with less time and fewer resources.
- **Process discipline.** Dedicated, committed and coordinated efforts from stakeholder organizations will drive positive and predictable results.

Figure 1. Today's NAE



- **Integrated, consistent and hierarchical metrics.** Relevant measurements must be linked throughout the processes and must build on each other.
- **Full transparency of data, information and activities.** Each piece of the enterprise must see the process ahead of it and the process behind it.
- **Accountability for actions and results.** People within an enterprise hold themselves accountable for actions taken and not taken.
- **Integrated governance structure.** Effective governance is adaptable to opportunities, inclusive and well-suited to work across boundaries and seams to sustain readiness.
- **Total ownership cost perspective.** A strategic financial management view provides the ability to understand and manage affordability, while balancing risk and meeting operational requirements.

More than 190,000 sailors, Marines, civilians and contractors contribute to the enterprise approach within Naval Aviation. They work in different organizations that must all cooperate to ensure cost-effective readiness. This enterprise behavior model has been successful in identifying and understanding cost and readiness degraders, and removing barriers to efficiently deliver warfighting readiness to the fleet.

The NAE Cost Initiative Key Stakeholders (The Stakeholders)

The NAE's Air Board is the governing body and is led by three 3-star Flag/General officers (Commander, Naval Air Forces, Vice Adm. D.H. Buss, U.S. Navy; Marine Deputy Commandant, Aviation, Lt. Gen. R.E. Schmidle, U.S. Marine Corps; and Commander, Naval Air Systems Command Vice Adm. D.A. Dunaway). To optimize readiness, each element composing that readiness—"people, stuff and money"—must be managed. Cross-functional teams are functionally focused to manage these elements properly. These cross-functional teams are composed of members from different stakeholder organizations and are critical to the success of the NAE. NAE cross-functional teams and focus areas include:

- **Current Readiness:** Focused on meeting current and future operational requirements at an optimal O&S cost.
- **Future Readiness:** Champions future readiness and cost issues that optimize Total Ownership Cost and future sustainability of new and legacy systems.
- **Total Force:** Focused on the NAE's people.
- **Integrated Resource Management Team:** Focused on providing integrated solutions and strategies across the NAE.

An important foundational process of the NAE is the Type/Model/Series (T/M/S) briefing cycle. During this process, platform-specific program reviews are conducted, beginning with an O-6 level weapons system review with the fleet and Program Management leadership and culminating with a concise issue-oriented brief to NAE leadership. This brief provides the opportunity for Flag/General officers and Senior Executive Service leaders to review and discuss readiness and

This enterprise behavior model has been successful in identifying and understanding cost and readiness degraders, and removing barriers to efficiently deliver warfighting readiness to the fleet.

cost degraders affecting the success of individual weapon systems, and also address systemic issues across the enterprise. These platform "deep-dive" reviews are critical in providing NAE leadership:

- Increased awareness and understanding of those factors causing readiness gaps and driving cost
- Awareness and status of engagement by provider organizations to mitigate gap drivers that negatively impact warfighter readiness
- Development of actionable plans to address readiness and cost barriers

Rear Adm. Timothy Matthews, Deputy Chief of Naval Operations for Fleet Readiness, said: "It's important to remind ourselves that our responsibility is to the warfighter and the taxpayer, and how well we support them is measured by our ability to advance and sustain NAE warfighting capabilities that meet current and future operational requirements at the optimal O&S sustainment cost. This is especially important during these austere financial times."

The NAE Strategic Guidance for 2013-2014 (The Goal)

The NAE Air Board recently released NAE Strategic Guidance designed to address the O&S shortfall. Highlights include:

- Reduce the overall Flight Hour Program's Cost per Flight Hour (CPFH) by 10 percent, with no net increase in military manpower. The following initiatives, although not all-inclusive, represent a roadmap to assist in reducing CPFH:
 - Apply the O&S Cost Reduction Initiative across all T/M/S platforms.
 - Implement the use of the Integrated Logistics Support Management System (ILSMS) data analysis tool.

- Increase speed to the fleet.
- Consistently deliver integrated and interoperable war-fighting capabilities.
- Improve affordability by reducing operating and sustainment costs for fielded systems and implementing life-cycle cost reduction initiatives as part of new systems development.

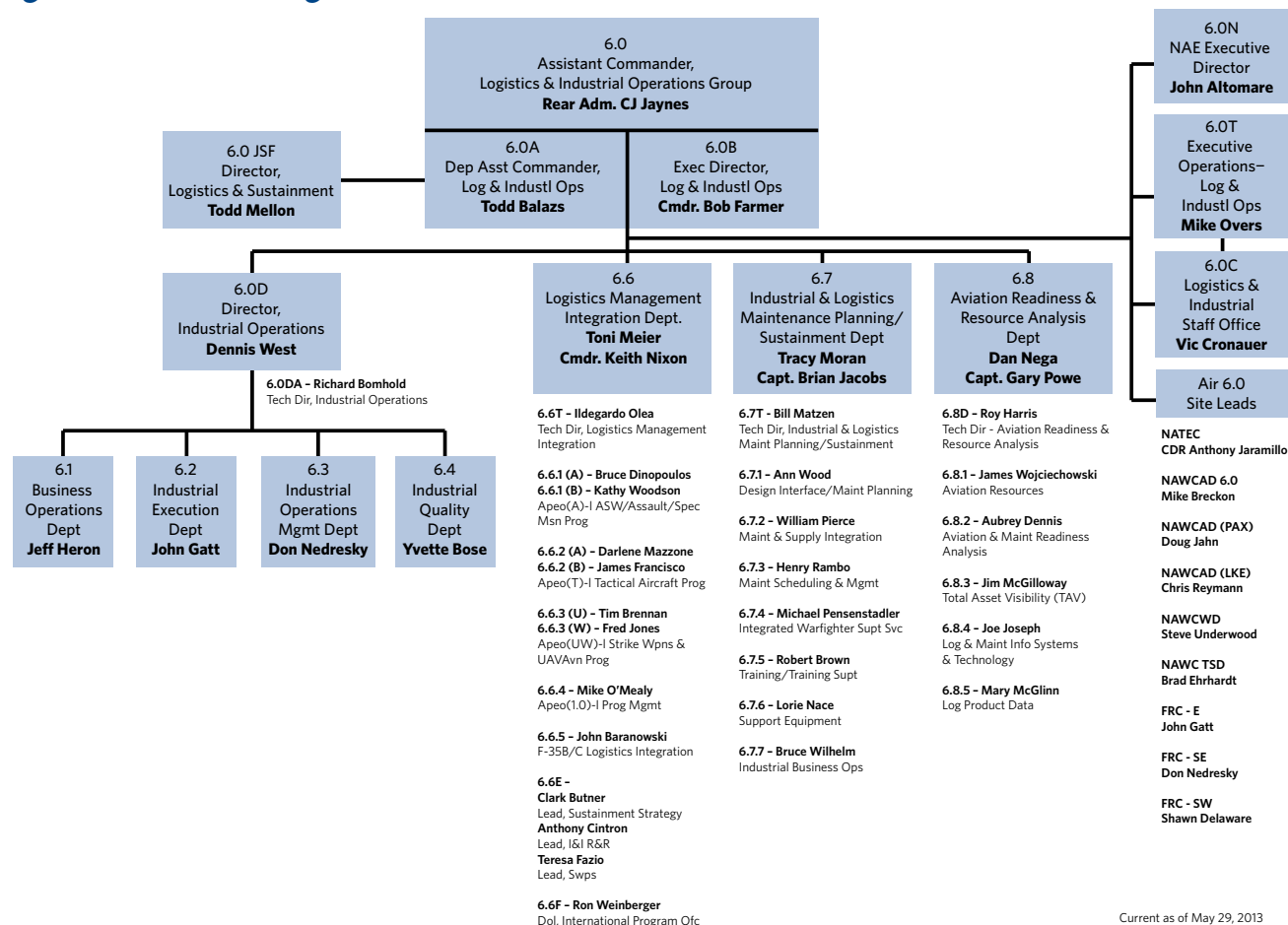
NAVAIR Commander Guidance (The Direction)

As the lead provider organization within the NAE, NAVAIR has a significant role in determining success in meeting the NAE's Strategic Guidance. Its organizational structure and reporting relationships with the Assistant Secretary of the Navy (Research, Development and Acquisition), the Program Executive Offices, and individual Program Managers AIR (PMAs) places NAVAIR in a unique position to affect cost efficiencies for T/M/S teams. In support of the Chief of Naval Operations' guidance to ensure that our warfighters are ready to fight and win while building capability for the future, VADM Dunaway has issued his NAVAIR Commander's Intent, which includes three main focus areas:

NAVAIR's commitment to improve affordability by reducing O&S cost in fielded systems and to introduce life-cycle cost reduction initiatives in new systems development has resulted in the introduction of key cost-cutting strategies that are being implemented across the enterprise.

Rear Adm. CJ Jaynes, NAVAIR Assistant Commander for Logistics and Industrial Operations (NAVAIR 6.0) and the Commander, Fleet Readiness Centers (COMFRC), is spearheading NAVAIR's initiative to improve affordability. Jaynes is uniquely qualified for this task, being a career logistician with more than 20 years of sustainment expertise, coupled with two tours as a Major Program Manager. The initiatives that her COMFRC, cost reduction and logistics integration teams have developed are the key enablers for the NAE's Strategic

Figure 2. NAVAIR Organization Structure



Guidance and NAVAIR Commander's Intent. These initiatives include O&S Cost and O&S Should Cost reduction efforts; the development and implementation of the ILSMS tool and corresponding Logistics Assessment data triage process; and the use of innovative COMFRC-related efforts that include Aviation Rapid Action Teams, Colocated Maintenance and Maintenance Optimization.

"In order for the NAE to meet the O&S cost reduction goals, three areas must be kept in center focus: First, the initiatives must be vetted, easy to implement, and effective when used; next, we must have buy-in from all elements of the NAE stakeholders from the flight line to the Triad; and lastly, the metrics we obtain from these initiatives must be accurate to a level to allow the leadership team to make informed business decisions," according to Rear Adm. Jaynes.

Emerging Sustainment Initiatives

O&S Cost and O&S Should Cost Initiative

The first initiative centers on finding cost efficiencies in depot maintenance, aviation depot level repairables and consumable materials. These cost drivers present the greatest opportunity for savings. The team recently launched best-practices, affordability and readiness strategies, all of which have been replicated across all platform teams. The O&S Cost effort focuses on reducing current readiness sustainment costs, while the O&S Should Cost effort focuses on reducing future readiness O&S costs that might be inherent in weapon system acquisitions.

The O&S Cost and O&S Should Cost initiative performs Root Cause Analysis (RCA) in four areas: Maintenance Practices, Maintenance Planning, Repair Capability and Contract Strategies. Maintenance Practices focuses on reviewing current fleet maintenance practices and identifying areas of opportunity for improving maintenance practices and/or reducing cost per flight hour. Under Maintenance Planning, the focus will be to apply actual failure data to current maintenance plans, investigate opportunities to turn high-cost consumables into repairables, and determine if additional repair capability is warranted. In Repair Capability, current repair capability and capacity at both Maintenance Level II (Intermediate) and Maintenance Level III (Depot) are documented. During the Repair Capability phase, the ARAT members interact with the platform team to better utilize Intermediate-Level repair capability to avoid costs associated with Depot-Level repair of assets. Under Contract Strategies, supply chain management support contracts are reviewed to seek opportunities to optimize cost-wise readiness and broaden the vendor base in an effort to reduce sustainment costs.

"To impact those issues driving readiness gaps and cost, we must continue to influence design for supportability to enable future readiness and attack readiness and cost drivers to enhance current readiness. By standardizing our readiness assessment processes, properly training our analysis teams,

"By standardizing our readiness assessment processes, properly training our analysis teams, and holding provider organizations and resource sponsors accountable, we can drive cost down and increase readiness."

—Rear Adm. CJ Jaynes

and holding provider organizations and resource sponsors accountable, we can drive cost down and increase readiness," Jaynes said.

Platform-Specific Logistics Assessments Utilizing the Integrated Logistics Support Management System (ILSMS)

The second initiative is centered on the implementation of the ILSMS tool in all platform program offices and the execution of the Logistics Assessment as a platform team enters its NAE briefing cycle.

The Logistics Assessment is a data triage process focused on the equipment pillar of the readiness PESTO (people, equipment, supply, training, ordnance) equation. It is designed to provide the T/M/S team with a standardized process for identifying their readiness and cost degraders. The ILSMS tool facilitates data triage as it provides the analyst with advanced analytical capabilities, simulation models and improved access to aggregated data. The primary objectives of the Logistics Assessment are to:

- Institutionalize a repeatable data triage process with a common understanding of readiness and cost degraders.
- Improve root cause analysis of those issues.
- Develop mitigation plans with provider organizations.
- Identify systemic issues across the enterprise.

ILSMS will help facilitate the root-cause and business-case analyses necessary to identify crucial linkage to reducing readiness and cost degraders. The system uses a 10-year historical baseline to identify components that are performing outside of established parameters. This ability will give leadership early indications of potential degraders and allow for mitigation

before they become readiness or cost degraders. ILSMS also provides more than 100 top-level metrics, with the detailed transactional data behind them, to assist in trend analysis. The Logistics Assessment and ILSMS are key enablers in addressing cost and readiness degraders with platform teams, provider organizations and resource sponsors to affect changes to improve readiness and reduce cost.

COMFRC Aviation Rapid Action Teams (ARATs), Colocated Maintenance (CLM) and Maintenance Optimization (MO)

A third initiative involves the use of innovative efforts developed at COMFRC designed to aggressively address repair throughput barriers, process inefficiencies, and readiness and cost degraders. These initiatives include the use of ARATs, CLM and MO.

ARATs are agile teams made up of analysts, engineers and logisticians whose purpose is to provide quick root cause analysis of potential cost and readiness degraders, and then formulate innovative solutions to overcome these barriers. Possible solutions could be to design a new maintenance or supply process, introduce a new tool or piece of equipment, or reassign and train a repair technician to perform a new or additional task. The ARAT team will be an important option available to the T/M/S team as its members work their cost and readiness degraders discovered during the Logistics Assessment.

The maintenance and supply business efficiencies coming from the CLM and MO efforts hold the promise of real cost savings. Both efforts present a graduated approach to integrating Level II (intermediate) and Level III (depot) main-

tenance activities and garnering cost efficiencies from that integration. Using FRC Southeast (Jacksonville, Fla.) as the testbed, COMFRC has mapped out processes and business rules, and conducted a prototype demonstration of the potential benefits of the Integrated Industrial Work Center. This prototype identified 36 components that could be repaired under this integrated maintenance approach, resulting in a reduction of \$320,000 in a Component Unit Price (CUP) for FY 2012.

As Rear Adm. John King, Naval Supply Systems Command Weapon Systems Support, said, "We are living in exciting times. While the pressures of smaller budgets are challenging, it is also a time where we can mine data across the NAE and leverage this information to make cost-saving decisions to the benefit of both the warfighter and the taxpayer."

Summary

For the DoD weapon system acquisition process and the subsequent fielding and sustainment phases, the NAE's renewed focus on effective cost management and program affordability has created a whole new opportunity to discover and implement innovative solutions to the readiness and cost degraders that have plagued T/M/S teams for a long time. The processes outlined in this article reflect the disciplined, multi-faceted approach the NAE will utilize to identify and execute life-cycle cost reduction while maintaining optimum aircraft readiness. &

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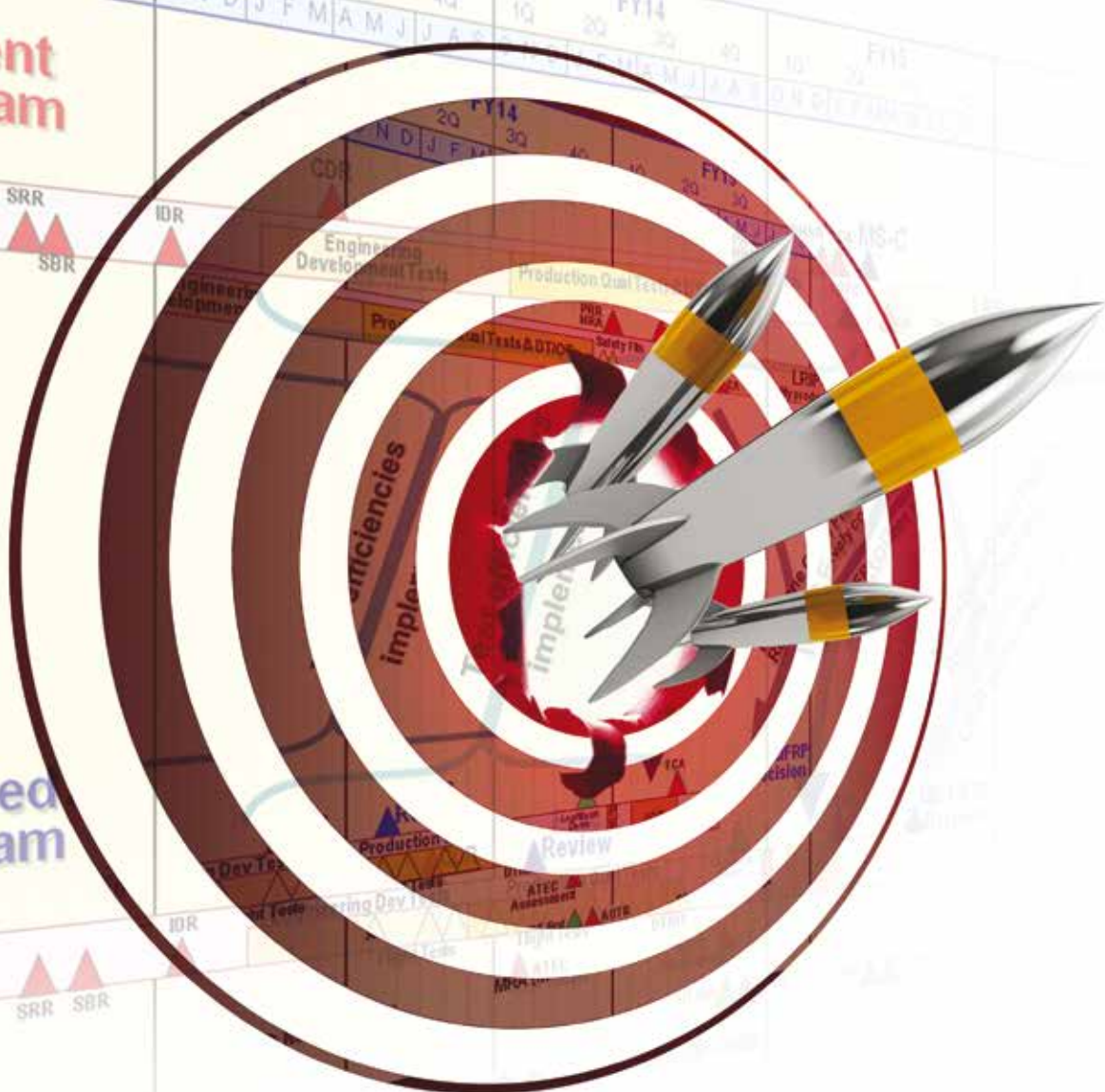
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Current
Program

Revised
Program



Alternatives for Success

One Program's Unconventional Structure

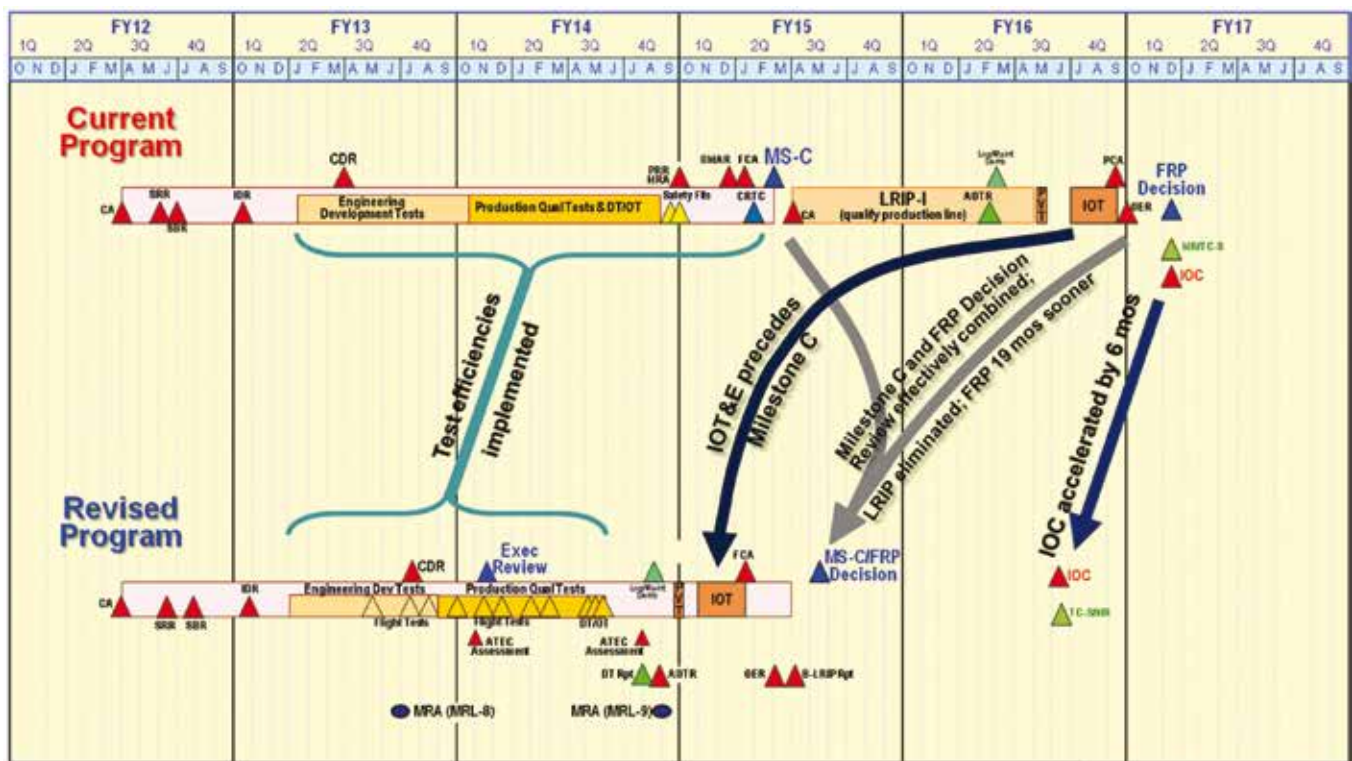
Maj. Christopher P. Hill

Frank Kendall, Under Secretary of Defense for Acquisition, Technology and Logistics, continues to champion the initiatives of the original Better Buying Power (BBP) and now BBP 2.0. This latest version incorporates new ideas and best practices from the original.

Introducing BBP 2.0, Kendall uses terms like “institutionalizing” and “policy changes.” Acquisition professionals would be mistaken to interpret these words to mean change must occur at a strategic level. Kendall also describes BBP 2.0 as a “management philosophy.” In my opinion, this is an important distinction. BBP initiatives provide a medium to cultural change. The core concept could be “Is there a better way?” Recently, Kendall has emphasized that the “policies are not set in stone.” Program managers (PMs) have to determine their best way to incorporate the BBP “philosophy” and design program structures to “optimize the potential for success.”

Hill is a U.S. Army assistant product manager for the Guided Multiple Launch Rocket System. He holds a B.A. degree in Political Science and an M.B.A. in International Business. He is a member of the Army Acquisition Corps with a Level II certification in Program Management.

Figure 1. Reduction of a Guided Rocket System's Program Time



The Product Manager, Precision Guided Missiles and Rockets (PM PGMR) has distilled Better Buying Power guidance into the team's mantra "Provide More Capability at a Better Value and Deliver It Faster While Sustaining It Longer." These guiding principles are executed by a committed team across the Precision Fires Project Office within Program Executive Office (PEO) Missiles and Space. We have accepted the challenge to execute cost savings and avoidance across the PGMR product line. The team's cost reduction initiatives are not only related to the original BBP initiatives but are focused on executing Kendall's guidance to pursue an optimal program structure.

The Guided Multiple Launch Rocket System (GMLRS) Alternative Warhead Program (AWP) is one program within the precision guided munitions portfolio that embraced BBP 2.0 initiatives through program streamlining and continuous "Should Cost" management. A transparent relationship across all Department of Defense (DoD) and industry stakeholders enabled a significant reduction of this program's length from 52 months to 36 months (see Figure 1) codified this year with a signed Test and Evaluation Master Plan (TEMP), Acquisition Strategy as well as modification of the existing contract to reflect the coordinated efficiencies.

Overall, the development remains on track to conduct 14 percent fewer test flights, reach Full Rate Production (FRP) 32 percent sooner, and field a critical capability 16 months earlier than the baseline schedule, all while using 10 percent less Research, Development and Engineering (RDT&E) funding. This equates to a cost savings of \$33.6 million in FYs 2014-2016.

Why is this effort to deliver capability faster and at a better value so important?

Growing Trend of MDAP Cost and Schedule Overrun

Look at history: The number of major weapon systems terminated because of schedule or cost overruns is increasing every year. The Final Report of the 2010 Army Acquisition Review examined the failure of Major Weapon Systems to transition from a new program of record to FRP during the last 2 decades. Between 1990 and 2000, seven Acquisition Category (ACAT) I programs were terminated. That number more than doubled between 2001 and 2010. Given this trend in the last 2 decades and the current budget environment, the next decade likely will be more dire. If that is not enough incentive, why else?

Senior Leaders Are Directing Us to Do Things Better

Kendall challenges PMs to ask a series of questions of themselves. These fundamental underpinnings to BBP became extremely important in shaping our path forward and understanding the risks involved.

How Urgently Is the Product Needed?

Policy necessitates timely development: The genesis of the AWP came from the "DoD Policy on Cluster Munitions and Unintended Harm to Civilians" that was signed by the Secretary of Defense on June 19, 2008. The policy directs that Cluster Munitions, like the GMLRS Dual Purpose Conventional Munition (DPICM), cannot be used after 2018 if they result in

more than 1 percent Unexploded Ordnance (UXO). The Army Acquisition Executive issued two Acquisition Decision Memorandums (ADM) in October 2008. The first ADM called for all future procurements of the DPICM to cease. The second ADM directed the Program Manager (PM) to undertake concept refinement of an Alternative Warhead (AW) for GMLRS that would comply with the Cluster Munitions Policy.

Capability gaps drive operational necessity: While the GMLRS DPICM rockets are still in the inventory, tactical commanders must receive approval by the Combatant Commander, reducing the tactical advantage of responsive precision fires when it is needed most. In July 2012, U.S. forces engaged an area target with 36 GMLRS Unitary rockets. Training Doctrine Command Fires Brigade analysis indicates the same mission could have been accomplished with four GMLRS AW rockets. Assuming a nominal cost of \$100,000 per rocket, mission cost would have been \$3.2 million lower (Unitary: 36 rockets x \$100,000 = \$3.6 million, AW: 4 rockets x \$100,000 = \$400,000). Additionally, the mission duration would have been reduced from minutes to seconds (Unitary: >20 minutes total, AW: <30 seconds total). The warhead design is simple and effective, adding to the combat-proven dependability of the entire system. This kind of operational necessity demands AW support the warfighter as soon as possible. This, perhaps, is the strongest statement that can be made.

What Are Customer's Priorities for Performance?

The Army's only cluster-munition-compliant surface-to-surface area weapon. The Army's current requirement to engage area targets and imprecisely located targets is cur-

rently satisfied by GMLRS DPICM. The cluster munitions policy defines cluster munitions as "munitions composed of a non-reusable canister or delivery body containing multiple, conventional explosive submunitions," yet acknowledges that "there remains a military requirement to engage area targets that include massed formations of enemy forces, individual targets dispersed over a defined area, targets whose precise locations are not known, and time-sensitive or moving targets." The GMLRS DPICM was the Army's precision fires solution to hit area and imprecisely located targets, but is not, and cannot be, made compliant with the policy's UXO requirement. The continued requirement for an area-target capability was validated for AW in the Nov. 8, 2008, Joint Requirements Oversight Council (JROC)-validated Capability Development Document. The AW rocket will engage the same target set as DPICM. Because of the level of commonality between AW and both DPICM and Unitary, AW will have the same range capability, launcher compatibility, and accuracy as the other GMLRS variants.

How Prepared Is Industry?

Straightforward design of the warhead and technology maturity of the GMLRS allows focus on warhead effectiveness:

Prior to Milestone B (MS B), the Precision Fires test team, in concert with the Army Test and Evaluation Command, identified a number of test efficiencies supported by their confidence in the warhead design. The TEMP written before MS B was generic with respect to warhead performance testing because the program was undergoing competitive prototyping of three warhead designs. Upon design selection for Engineering, Manufacturing and Development (EMD), the Product Office

Figure 2. Guided Rocket System With Change in Warhead Only





Inset: First Guided Multiple Launch Rocket System Alternative Warhead flight test. Missile approaches target.

Above: Warhead detonates on the ground.
U.S. Army photos

tailored the test program specifically to the selected warhead design. The team also leveraged a high level of commonality with the GLMRS Unitary rocket to focus on only those tests needed to demonstrate and characterize warhead lethality. The GMLRS AW rocket is based on a materiel change to the current production GMLRS Unitary rocket, which is at Technology Readiness Level (TRL) 9. The rockets remain 90 percent common as illustrated in Figure 2, with only the warhead section being different.

Mature production line capability key: The high level of commonality between the rocket variants and the maturity of the shared GMLRS production line allows for a nontraditional acquisition approach to Initial Operational Test and Evaluation (IOT&E). The Department of Defense Instruction 5000.02 process provides for a Low Rate Initial Production (LRIP) period following the MS C. According to Title 10, United States Code, Section 2400(b), LRIP is intended to

- Provide production-configured or representative articles for operational tests.
- Establish an initial production base for the system.
- Permit an orderly increase in the production rate for the system sufficient to lead to full-rate production upon the successful completion of operational testing.

The current GMLRS Unitary rocket production line is assessed at Manufacturing Readiness Level (MRL) 10, and the AW warhead will be a form-and-fit match with the Unitary warhead. The production line will be shared with interchangeable Unitary and AW payloads based on need. As such, only minor tooling and process changes are required for Production Qualification Testing (PQT). At the conclusion of PQT flight tests, Production Line Validations and the Manufacturing Readiness Assessment, AW will have demonstrated MRL 9, indicative of a LRIP production line ready to produce test articles for IOT&E.

What Resource Constraints Will Affect Program Risk?

Time. These test efficiencies will allow FRP and Initial Operating Capability (IOC) to be achieved sooner. Progress must be watched carefully, as reducing schedule also means there is less time to recover from challenges typical of an EMD program. While commonality with Unitary does reduce technical risk, it is not assumed that risk is eliminated completely.

Funding. Over the past year, we have seen schedule risk grow due to Continuing Resolution Authority and Sequestration. These two actions impact the program schedule by placing constraints on funding availability, contractual need dates and time to execution. The AW program fully expects this scenario to continue in the coming fiscal years and is planning alternate, contingency and emergency means to keep the program progressing on schedule and cost as well as possible.

Materials. Tungsten penetrators and explosive chemicals represent 80 percent of the warhead's cost. Few suppliers can deliver these materials in suitable quantities and none

are domestic sources. This reality limits competition and opportunities to drive down base materials costs. Advanced pricing agreements cannot mitigate politically induced availability and risks.

Is Cost or Schedule Most Important, and What Are the Best Ways to Control?

It's a toss-up. A strong argument can be made for either cost or schedule. The enactment of the cluster munitions policy places criticality on schedule. FRP must begin in FY2015 to ensure adequate quantities of AW can be produced prior to the policy enactment. This is based on several factors, not least of which is synchronization of production deliveries with the Total Army Munition Requirement (TAMR) quantities for FY2015–FY2019. Average Production Unit Cost (APUC) estimates are subject to change during EMD, and the demand comes when DoD is seeking to reduce budgets, not increase them. Therefore, controlling cost is essential to ensuring that the AW remains an affordable capability.

Program Controls. The program controls schedule and cost by various methods. The rocket will be 90 percent common with the Unitary platform. This fact alone provides schedule and cost benefits. A Firm-Fixed-Price (FFP) contract with performance-based payments helps mitigate cost growth typically associated with Cost Plus type EMD programs. However, this can be a hard sell to the contractor.

The following are my observations based on experience as an assistant PM on a major defense acquisition program implementing our “optimal program structure.”

Getting Buy-In

Implementing “Should Cost” management principles is challenging. In the AW case, the goal was to update testing requirements to reduce the developmental timeline. The Product Office began a two-pronged approach: (1) update the TEMP and Acquisition Strategy, and (2) simultaneously gain support from key stakeholders (Test and Evaluation, G3/5/7, G4 agencies from Headquarters Department Army Staff and Office of the Secretary of Defense). While the former action was administrative in nature, the later became a critical supporting action. Signatories were informed in advance of how and why we were modifying the TEMP and Acquisition Strategy. Staffing did not become an iterative process. This open, upfront, and direct approach boosted the confidence of all stakeholders to embrace a new strategy.

Turning the Ship


Anticipating a need to act quickly, the Product Office began parallel actions to emplace the “Should Cost strategy.” The Acquisition Strategy and TEMP were updated to quantify the changes required. Our previous engagement of key stakeholders ensured that these documents moved to approval. The current contract limited how much “preparing” the prime contractor could do. However, to meet the MSC and FRP strategy, the program needed to reorient immediately. Baseline contract

activities were ongoing and certain contracted tasks needed to cease or risk sunk costs for unnecessary work. Significant testing would begin within 60 days. The prime contractor required contractual guidance to begin reconfiguring hardware to support our new direction. The immediate challenge became obvious. Several contract solutions were required to reorient the program. First, the Procurement Contracting Officer (PCO) sent a limited stop-work letter for Contract Line-Item Number tasks that were not needed. Based on the expected approval dates for the updated TEMP and Acquisition Strategy, a definitive contract modification could not be completed in time to maintain schedule. To mitigate this risk, the PCO worked with the prime contractor to prepare and award a not-to-exceed (NTE) change order to the existing contract. This NTE provided a contractual “bridge” until completion of a modification to the contract in third quarter FY2013.

Act Tactically, Think Strategically

Without proper focus and direction, any successful path can become fraught with risk. There are ways to minimize impact and likelihood of occurrence. However, this requires “acting tactically and thinking strategically.” The efficiencies gained through use of “should cost” management principles do come at a price. The schedule can become very fragile and must be protected by vigilant management. Delays from various issues can desynchronize interdependent and sequential tasks. Our program employs recurring Integrated Product Teams (IPTs) along functional areas. While these teams are not a new concept, they must be free to act tactically. The AW program has achieved monumental success albeit with challenges in navigating through all the decision authorities en route to approval of the appropriate documentation. At the IPT level, the ability to make decisions that will be supported up through to the signatories continues to improve. At the stakeholder level, “thinking strategically” is the focus. To promote this environment, biweekly stakeholder coordination meetings and quarterly Management Roundtables are conducted to enhance program success at all levels. For these members, it is important to remain vigilant in assessing where “seeds of risk” are being introduced by our actions today.

No One Said It Would Be Easy

In our attempt to find and implement an “optimal program structure,” we have had success and failure. Today, we are on a solid course to achieve our goal of providing a munition that is more capable, a better value, and faster to the warfighter. The AW is structured to “optimize” the program’s chance of success. This is a good news story for both the warfighter and the taxpayer. We re-emphasized the success of the GMLRS Program by building on commonality and investment that has already been made. This saves money and speeds delivery of capability. The Alternate Warhead Program is a model of success for both new programs and new increments of existing systems. 


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Where Sustainment Meets Deployed Forces

Do You Really Know Who's Going to
Maintain Your Aircraft and
Where It's Going to be Maintained?

*Cmdr. Mark Nieto ■ Ann Wood
Mike Kotzian ■ Duane Mallicoat*





Did you know that an 18-year-old is fixing a \$55 million aircraft on the flight deck of an aircraft carrier at night, with rolling seas and salt spray shooting across the flight deck? Did you know that a 20-year-old is on deployment in Afghanistan maintaining an aircraft that just landed in a sandstorm? And, finally, did you know that a South Korean aerospace company is performing scheduled depot maintenance on U.S. Marine Corps helicopters?

How can one possibly plan to maintain aircraft in such myriad environments, cultures and geographically dispersed locations? A key question to ask as acquisition professionals is: "Have we properly equipped those maintainers with everything that they need to effectively and affordably perform the maintenance that is required so those aircraft can quickly return to an operational status in order to support training and combat operations?" Let's discuss how it is possible to properly equip these maintainers for success and how Naval Aviation is approaching maintenance planning, scheduling and execution (MPS&E).

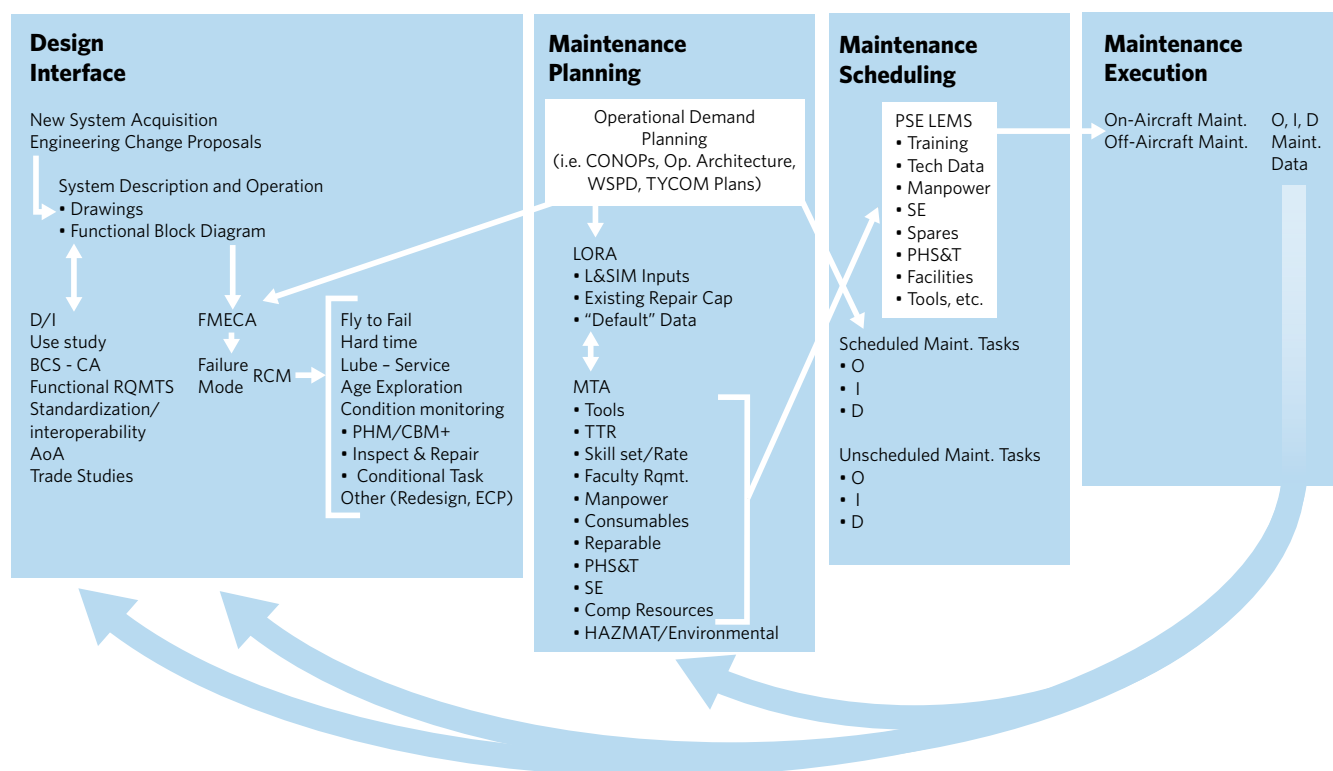
Supporting Combat Readiness Now and in the Future

When faced with the requirement to support the Naval Aviation Enterprise (NAE), one must not just think land-based. The possibilities of where the systems will operate and be maintained include land-based; ship-based (carrier, cruiser, destroyer or amphibious); multi-aircraft detachments; and foreign countries, including foreign military sales (FMS). Today's depot artisan, plus the industrial repair sites referred to as Fleet Readiness Centers (FRCs), must be flexible and their capabilities must be exportable on a moment's notice to support the warfighter's needs regardless of location.

Within the Naval Air Systems Command (NAVAIR) is the Industrial & Logistics Maintenance Planning & Sustainment Department, NAVAIR 6.7, with its major focus and responsibility on Maintenance Planning and Scheduling. NAVAIR 6.7, as shown in Figure 1, is implementing standardized processes to support the NAE goal of combat readiness now and in the future. The MPS&E process identifies four primary areas—Design Interface, Maintenance Planning, Scheduling

Nieto is the commanding officer at FRC Western Pacific, **Wood** is the director of the NAVAIR 6.7.1 Design Interface & Maintenance Planning Division at NAVAIR Patuxent River, Md., **Kotzian** is the ACQPM department chair at the Defense Acquisition University's Mid-Atlantic Region in California, Md., and **Mallicoate** is the associate dean for Outreach and Mission Assistance at DAU's Mid-Atlantic Region.

Figure 1. Life-Cycle Maintenance Planning, Scheduling & Execution



and Execution. Operational Demand Planning is the crucial element that drives the entire MPS&E process. Operational Demand Planning information comes from the Concept of Operations (CONOPS), the Joint Capabilities and Integration Development System (JCIDS), Operational Architecture of the system, the Weapons Systems Planning Document (WSPD) and the Type Commander Plans. A deeper look into the four primary areas benefits the understanding required for identification of the process.

Design Interface—influence the design: The Design Interface goal for a new weapon system acquisition or Engineering Change Proposal is to eliminate, reduce or simplify the need for logistics. This is accomplished by influencing the design during the systems engineering process from its inception throughout the life cycle.

Plan for Maintenance commonly is referred to as Maintenance Planning. You may ask, “Why do we have to perform maintenance?” Simply put, maintenance is required on a weapon system primarily to mitigate a failure mode that could not be designed out of the weapon system. The reason it could not be designed out usually falls into two areas: We could not afford to design the failure mode out or the technology wasn’t available/mature enough to design out the failure. Utilizing Failure Modes Effect and Criticality Analysis (FMECA) data, Reliability Centered Maintenance (RCM) analysis is conducted on the maintenance significant failure modes. The output of the RCM analysis includes recommendations—i.e., no preventative maintenance required or age exploration or some type of

preventative maintenance task required. An output also could be a recommendation for a Condition Based Maintenance Plus (CBM+) or Prognosis Health Maintenance (PHM) type solution to mitigate the failure mode. Maintenance Task Analysis and Level of Repair Analysis then are conducted on those maintenance tasks that subsequently provide the Product Support Manager (PSM) with the requirements for the Product Support Package. (Naval Aviation utilizes the three-level maintenance concept. Maintenance levels are determined by the Supportability Analysis conducted within the NAVAIR 6.7.1.)

Maintenance Scheduling is conducted for both “scheduled” and “unscheduled” maintenance actions at all three levels of maintenance. Scheduling of maintenance tasks is completed based upon operational requirements and production schedules.

Maintenance Execution: In the end product, all the 12 product support elements come together, and maintenance actually is performed at the O, I, & D levels. Measures (metrics) are being put in place throughout the life-cycle MPS&E process to ensure that what was “planned” for “actually” is happening. Those measures are the early indicators that something isn’t working according to plan and a root-cause-analysis is needed.

So we now have looked at an overview of the four key areas that NAVAIR 6.7 has highlighted as “focus areas” for improving weapon system sustainment. While policy and planning are one end of the question, the actual tip-of-the-spear execution can be quite another. We now will shift our focus to the “tip of

the spear” and look through the eyes of Fleet Readiness Center Western Pacific (FRCWP) to see how these process improvements will help conduct the myriad necessary repair events to support forward deployed operations, as well as help face the challenges that still exist.

FRC Western Pacific Overview

First a quick overview of FRCWP, so you have an idea on the scope of the command and required support. FRCWP’s vision is to be a world-class Forward Deployed Depot Maintenance Activity. The goal is to provide quality depot level aviation maintenance for all Navy and Marine Corps Forces outside the United States through:

- Scheduled Maintenance with International Commercial Partners for 12 Types, Models, Series Aircraft
- Unscheduled Maintenance through In-Service Repair (ISR) for all Types, Models, Series
- Support Equipment Overhaul

FRCWP’s primary customers for scheduled depot aircraft maintenance are 1st Marine Air Wing (1st MAW), Carrier Air

from FRCWP is essential to support forward deployed readiness requirements. FRCWP is a one-stop-shop operation where planned maintenance events, modifications and any required ISR tasks must be accomplished in conjunction with each other. This means all maintenance tasks, engineering support and required parts support must be aligned to meet completion dates for the aircraft.

“Working to together”—Results of NAVAIR 6.7 Emphasis on Deployed Operations

Next we will look at some lessons learned within FRCWP operations that are being used to improve upon the maintenance planning policies, processes, tools and training within NAVAIR 6.7.

Design Interface and Maintenance Planning

- **Design Interface/Maintenance Planning Products:** Maintenance specifications (specs) for scheduled depot maintenance events typically have been developed for organic, CONUS FRCs. This has caused major problems for the foreign commercial companies as the specs were not written as detailed work packages. (CONUS FRCs develop

Measures (metrics) are being put in place throughout the Life Cycle MPS&E process to ensure that what was “planned” for “actually” is happening. Those measures are the early indicators that something isn’t working according to plan, and a root-cause-analysis is needed.

Wing FIVE (CVW-5), HSM-51, HSC-25 as well as all CONUS Patrol and Reconnaissance P-3 Wings. Additionally, FRCWP performs ISRs on deployed USN and USMC aircraft as well as other Services and coalition partners around the world. It also performs Ground Support Equipment overhaul for all USN/USMC forces outside the Continental United States. FRCWP is headquartered at Naval Air Facility Atsugi, Japan, and has detachment sites in Iwakuni and Okinawa, Japan; Sacheon and Gimhae, South Korea; Camp Bastion/Leatherneck, Afghanistan; Singapore and Guam.

Scheduled Aircraft Depot Maintenance Overseas

FRCWP performs scheduled aircraft depot maintenance using international contractors. Currently, these contractors are NIPPI Corp., Korean Air (KAL), Korean Aerospace Industries (KAI) and Defense Support Services (DS2). The other Services also use some of these same companies for aircraft overhaul. One difference between FRCWP and CONUS activities is that operational squadrons normally receive the same aircraft back from FRCWP that they induct, and there is very little aircraft Work In-Process (WIP). There isn’t an “aircraft buffer,” so the on-time delivery of aircraft

associated work decks with detailed procedures to execute the RCM justified maintenance specs.) NAVAIR 6.7.1 is updating policies, processes and training to require valid Maintenance Task Analyses for all levels of maintenance, including depot, to help resolve spec issues.

- **Technical Data Efficiencies:** Another challenge at FRCWP is that foreign international companies are working on aircraft developed and built by U.S. companies. This creates a foreign disclosure issue that must be managed carefully. In addition, the data can be proprietary and disclosing the data to potential competing companies is a major issue that must be worked through in each NAVAIR Program Office. FRCWP works closely with the NAVAIR Program Offices—individually called a “PMA” for Program Management, Air—to ensure data and proper disclosures in order to award contracts and perform maintenance with foreign providers.

Maintenance Planning & Execution

- **Increased and Effective Communication and Planning with PMAs:** FRCWP faces the challenges of incorrect/outdated program CONOPS and Weapon System Planning Documents (WSPD). Most original CONOPS, plans and

refinements are CONUS-focused, leaving FRCWP to figure things out when Type/Model/Series come into the area of responsibility. FRCWP is working diligently with the PMAs to help them understand the unique construct at FRCWP. The command has been working with AIR 6.7 to reach all the maintenance planners from a central source so they can properly plan for maintenance events in the FRCWP arena. (Accurate CONOPS, WSPDs, and Type Commander Plans will lead to refinement of Integrated Maintenance Concept prototype/Integrated Master Plans at all locations, including OCONUS, and will improve the strategic scheduling requirement discussions with the Fleet customers.)

- **In-Service Repairs (ISRs) and Effective Collection and Use of Maintenance Data:** FRCWP and NAVAIR know how critical it is to capture maintenance data in order to refine the maintenance requirements and specifications, specifically since effective RCM depends on accurate maintenance/failure data and artisan/maintainer input. Unfortunately, the repair data from these unscheduled depot maintenance actions—ISRs in particular—have not been captured over time. This is valuable data that RCM engineers and analysts could have used to update maintenance requirements. FRCWP and AIR 6.7 are working to implement a maintenance data capture system for all TMS that will capture the RCM quality data from these ISRs and scheduled maintenance events.

NAVAIR Commander's Focus area of "Increase Speed to the Fleet."

Maintenance Scheduling

- **Integrated Maintenance Concept (IMC) Event Builder and Execution Tool:** FRCWP is working to implement an "IMC Event Builder and Execution Tool," now in the functional requirements definition stage. It will enable the translation of specs into detailed work packages and provide a Web-based data collection and sharing tool set. The AIR 6.7.1 IMC and RCM national leads are working closely with FRCWP to ensure that their valuable maintenance data and knowledge are shared readily with the rest of the NAE.

Future DoD Focus on the Pacific and the "New" Challenges

DoD has stated a shift in focus to more emphasis within the Pacific Theater. Planned redeployment of U.S. Navy and U.S. Marine Corps forces in the Pacific has already begun and will require FRCWP to adjust as its customer base grows. This is an exciting time for leading change in the Pacific.

Unscheduled depot maintenance requirements have grown every year and the growth has been felt within FRCWP, which has seen a steady growth in the number of requests for ISRs (an increase of 65 percent over the last 5 years). FRCWP

FRCWP expects ISR demand to remain constant or grow based on planned operational support, even with the planned drawdown of forces in Afghanistan.

Our engineers and logisticians will use the data to improve existing maintenance plans. An increased focus on data collection at the task level as part of the maintenance execution phase will improve RCM analysis, resulting in highly effective maintenance plans.

- **FRCWP Quick Response Teams:** FRCWP has created 10 three-man teams with two mechanics and a Planner and Estimator aboard every deployed aircraft carrier (CVN) and at Camp Bastion, Afghanistan. The Afghanistan Detachment also has artisans on a rotational basis from other FRCs and Navy Reserve military personnel from the Forward Deployed Combat Repair Team managed out of Patuxent River, Md. FRCWP also has machinists and F/A-18 Fuel Cell Mechanics for as-needed requirements. When not on regularly scheduled deployments, the teams are on-call to respond anywhere in the world other than CONUS or Hawaii. These teams operate in direct support of the

expects ISR demand to remain constant or grow based on planned operational support, even with the planned drawdown of forces in Afghanistan. This will entail some additional strategic planning from FRCWP to ensure that sufficiently qualified artisan personnel and an adequate supporting structure are available to meet the expected growth. This also will entail leveraging expertise and sharing challenges and lessons learned with NAVAIR in order to improve the Maintenance Planning process.

Conclusion

Remember the myriad environments, skillsets and cultures we discussed in the beginning? Whether it is an 18-year-old maintaining an aircraft on the flight deck or in the desert, or a foreign international depot artisan performing scheduled maintenance in South Korea, the PSM must ensure that we properly plan for maintenance at all levels (O, I & D), all locations, and at the right time (interval) while optimizing resources.

We have shown how enhanced focus on specific areas of the Life Cycle Maintenance Planning, Scheduling & Execution System at the NAVAIR NAE level will serve as an enabler to the forward deployed aircraft repair sites. Additionally, we have shown how FRCs lessons learned are being used to provide enhancements to NAVAIR 6.7's maintenance planning processes and tools—which will lead to positive impacts for the forward deployed customers on the tip of the spear.

We discussed the initiatives and desired outcomes with Rear Adm. CJ Jaynes, former Commander Fleet Readiness Centers and NAVAIR Assistant Commander for Logistics and Industrial Operations. She provided the following insight: “As one can imagine, it’s extremely challenging to plan for all of the operational scenarios associated with supporting the Naval Aviation Enterprise. That is why it is so essential that we utilize our core processes (such as Design Interface and Maintenance Planning) and let these robust analyses build and sustain our product support packages to affordably meet readiness requirements throughout the life cycle of a weapon system.”

We are all very aware of the focus on Operations and Support Costs as a percentage of the annual National Defense Authorization Act DoD budget. So we asked Rear Adm. Timothy Matthews, OPNAV N43—director of Fleet Readiness—how initiatives like those of NAVAIR 6.7.1 have impacted current and out-year budgeting within the Planning, Programming, Budgeting and Execution process. Matthews said, “We are faced with great fiduciary challenges but we must remain fo-

cused on the readiness of our platforms and people to avoid a ‘hollow force.’ We must continue to safely operate and maintain our aging Fleet of aircraft while introducing new weapon systems, all while facing significant budget shortfalls.

“It is imperative that we have optimized maintenance processes with repair turnaround times that allow the NAE to consistently meet our readiness requirements. And what I mean by ‘optimized’ is that we don’t ‘over-maintain’ or ‘under-maintain’ our aircraft. We need to maintain the aircraft when and where it is needed to safely, effectively and affordably support our combat forces. The efforts of FRCWP, COMFRC [Commander, Fleet Readiness Centers] and NAVAIR 6.7 are great examples of what must be done to ensure that Naval Aviation remains a viable deterrent to those who want to do us harm,” Matthews said.

In today’s austere budget environment, we must all take another look at what might have been “status quo” on how to approach the way we do business. This is but one example of how the Logistics and Industrial Competency within NAVAIR is approaching the areas of maintenance planning and how the implemented changes will enable the forward deployed FRC to turn the “new” policy into actionable processes to support the warfighter’s operational needs where it matters most. 🛩️

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Cybersecurity

Defending the New Battlefield

Steven J. Hutchison, Ph.D.

Cybersecurity is one of the most important challenges for our military today. Cyberspace is a new warfighting domain, joining the traditional air, land, sea and space domains—and cybersecurity considerations apply to almost all major defense acquisition programs.

Weapon systems and information technologies operate in an increasingly complex, networked, joint information environment, within which the threat has demonstrated itself to be remarkably agile, capable and persistent. To ensure programs are adequately prepared to deploy capabilities and support operations in the contested cyber domain, developmental testers must have robust, continuously improving methodologies and infrastructure to test and evaluate (T&E) our network-enabled military capabilities.

Hutchison is the principal deputy for developmental test and evaluation in the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics.

The Office of the Deputy Assistant Secretary of Defense for Developmental Test and Evaluation (DASD[DT&E]) and Director, Test Resource Management Center (TRMC) has embarked on a course to improve the conduct of, and resources supporting, cybersecurity DT&E to set the conditions for improved production and deployment of enhanced capabilities to the warfighter. Dubbed “Shift Left” (see this author’s article in the September-October issue of *Defense AT&L* magazine), the initiative fundamentally is about earlier identification of design issues and potential failure modes through mission-focused testing in the four key areas of performance, reliability, interoperability and cybersecurity.

Developmental testing always has had a focus on performance and reliability, although it generally has been characterized as “technical testing.” Interoperability and cybersecurity testing, however, frequently are absent during DT&E since the certification processes permit programs to defer testing until after the decision to begin production. Technical focus and late testing cost programs in the long run. Hence, a Shift Left DT&E strategy adds mission context in all four key areas before production begins. A Shift Left strategy will help programs achieve Better Buying Power by avoiding the high costs and delays associated with problem discovery late in the life cycle. More important, a Shift Left strategy will help reduce the impact to our warfighters of fielding capabilities that do not satisfy user needs.

Military capabilities are vulnerable in the cyber domain. This of course is not a surprise, but the types of vulnerabilities and the ease with which they are uncovered is. Considerable data from testing cybersecurity in operational exercises show that fielded systems exhibit many common vulnerabilities. Clearly, programs should have found and corrected many of these vulnerabilities before fielding the system, which suggests the need to augment the certification and accreditation (C&A) process with robust cybersecurity DT&E to improve our ability to find and reduce system vulnerabilities. Therefore, to facilitate enhanced cybersecurity DT&E for acquisition programs, the office of the DASD(DT&E) and TRMC published Guidelines for Cybersecurity DT&E and operates the National Cyber Range (NCR) to

- Change how we think about and conduct cybersecurity testing.
- Help chief developmental testers and lead DT&E organizations develop and execute a robust cybersecurity DT&E strategy.
- Help acquisition decision makers understand cybersecurity risks.
- Improve resilience of network-enabled military capabilities.

The guidelines are available for download from the Acquisition Community Connection at <https://acc.dau.mil/Community-Browser.aspx?id=22039>.

**Given our military dependence
on network-enabled
capabilities, the lack of a
cybersecurity KPP is a major
shortcoming with downstream
effects in system development
and DT&E, and ultimately
places our warfighters at a
disadvantage.**

Background

DoD has long-standing processes for verifying the security of information systems. The first documented process appears to be the 1972 DoD Directive 5200.28 titled *Security Requirements for Automatic Data Processing (ADP) Systems*, reissued in 1988 as *Security Requirements for Automated Information Systems (AISs)*. These early directives also introduced the requirement for systems to have a Designated Approving Authority (DAA), and assigned responsibilities to the DAAs, many of which are still in use. For example, the 1988 directive stated: “The accreditation of an AIS shall be supported by a certification plan, a risk analysis of the AIS in its operational environment, an evaluation of the security safeguards and a certification report, all approved by the DAA.” A companion DoD Manual (DoD 5200.28-M, January 1973) and DoD Computer Security Center Standard (CSC-STD-001-83, Aug. 15, 1983) titled *Trusted Computer System Evaluation Criteria*, provided guidelines for security testing. In December 1997, the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD[C3I]) issued formal procedures for certification and accreditation (C&A) in DoD Instruction 5200.40, *DoD Information Technology Security Certification and Accreditation Process (DITSCAP)*. The DITSCAP instruction defined security test and evaluation (ST&E) as “examination and analysis of the safeguards required to protect an IT system, as they have been applied in an operational environment, to determine the security posture of that system.” The DITSCAP instruction also described the use of “penetration testing” during the validation phase as “strongly recommended to assess the system’s ability to withstand intentional attempts to circumvent system security features by exploiting technical security vulnerabilities. Penetration testing may include insider and outsider penetration attempts based on common vulnerabilities for the technology being used.”

Security testing remained under the purview of the DAA, however, which prompted an important distinction between DAA oversight of the C&A process and traditional T&E that resulted in a new director of operational test and evaluation policy in November 1999, to include operational testing of information assurance (IA) in the evaluation of system effectiveness and suitability. This guidance has remained in effect (with various updates) to the present.

Issuance of DoD Directive 8500.1, *Information Assurance*, in October 2002, canceled the 5200.28 directive, manual, and standard, although the DoD Instruction 8500.2, *Information Assurance Implementation*, in February 2003, continued DITSCAP as the applicable C&A process. In July 2006, the ASD for Networks and Information Integration (ASD[NII]) canceled DITSCAP, issued interim guidance, and then released DoD Instruction 8510.01 in November 2007, implementing the Defense Information Assurance Certification and Accreditation Process (DIACAP). The DIACAP process did not retain security test and evaluation. As this article was written, the next evolution of DoD information security policy was under way to replace DIACAP with the “risk management framework” (RMF). Among the notable changes, “cybersecurity” will replace “information assurance” and “Authorizing Official” will replace DAA.

The requirements system, or Joint Capabilities Integration and Development System (JCIDS), as described in Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01H, does not address IA or cybersecurity, although earlier versions of JCIDS and the predecessor “requirements generation system” made limited references to IA. Acquisition programs have a set of “mandatory” key performance parameters (KPPs), including force protection, survivability, sustainment, Net-Ready (NR), training and energy. For a short time, IA was an element of the NR KPP. In November 2003, CJCSI 6212.01C introduced the NR KPP as a replacement for the interoperability KPP with IA as one of its four elements. However, satisfying this element of the NR KPP essentially was equivalent to completing DITSCAP or

DIACAP. Therefore, in March 2012, CJCSI 6212.01F eliminated the IA element, noting that IA is the responsibility of a DAA. Today, cybersecurity appears only as a “potential attribute or consideration” of the survivability KPP. Given our military dependence on network-enabled capabilities, the lack of a cybersecurity KPP is a major shortcoming with downstream effects in system development and DT&E, and ultimately places our warfighters at a disadvantage.

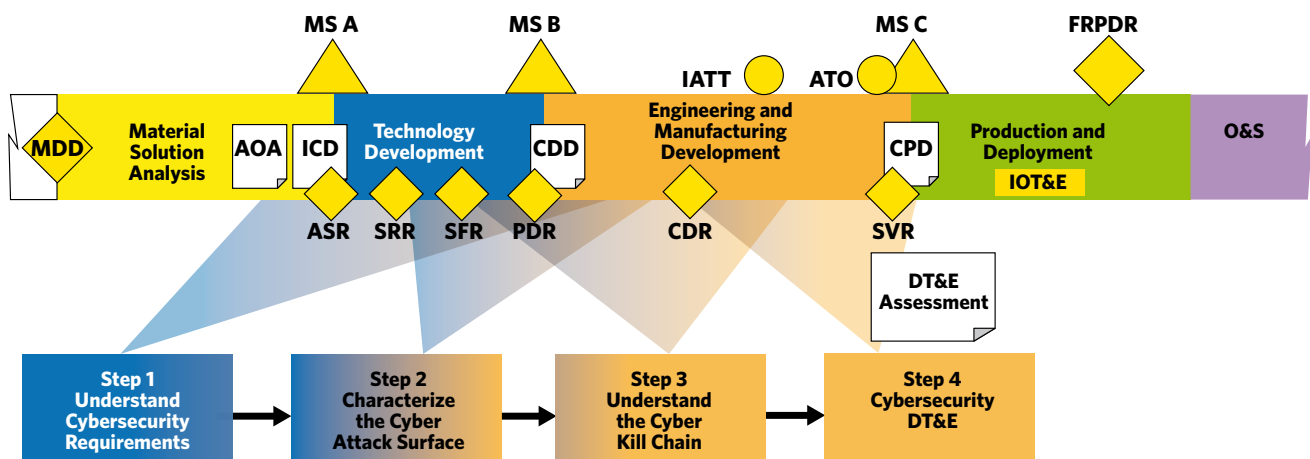
The parsing of IA/cybersecurity into “DAA space” has had, to some degree, the unintended consequence of decreasing its visibility in the acquisition, requirements and DT&E communities. Security test and evaluation never gained traction as DT&E practice since the DAA bases accreditation decisions upon the recommendation of a certifying authority, not a traditional test organization. The certifying authority rarely is included in the T&E working integrated process team (T&E WIPT), and the certification test strategy rarely is integrated into the T&E Master Plan (TEMP). For the DT&E community, the implications include insufficient numbers of, and training for, cybersecurity test professionals in the T&E career field; lack of well-defined cybersecurity metrics and evaluation framework; and uncertain capacity for supporting acquisition programs in cyber test facilities. With weak ties to the requirements and test community and a multitude of certifying authorities, the result is tremendous variability in implementing cybersecurity across the defense enterprise and, as field test data demonstrate, vulnerable systems that our cyber adversaries can exploit. The C&A process is necessary but not sufficient to ensure resilient systems in the field.

When combined with the C&A process, the Guidelines for Cybersecurity DT&E is a means to fill the test gap. The remainder of this article summarizes the guidelines.

Guidelines for Cybersecurity DT&E

The goal of cybersecurity DT&E is to improve the resilience of military capabilities in the presence of cyberattack. Cybersecurity DT&E extends beyond the foundation established

Figure 1. Cybersecurity DT&E process



through the C&A process to translate cybersecurity requirements, host environment, threat, and other considerations into meaningful tests designed to understand cybersecurity risks to the mission and improve resilience. Cybersecurity DT&E is a continuum of activities intended to improve production readiness at Milestone C. Figure 1 depicts cybersecurity DT&E in the acquisition life cycle. The steps may apply to different phases of the acquisition life cycle, depending upon the phasing of program engineering and production activities. Historically, TEMPs and associated test plans have not addressed adequately cybersecurity measures or resources such as cyber ranges. The chief developmental testers, lead DT&E organization and the certifying authority should seek opportunities to improve efficiency by integrating cybersecurity into other planned DT&E events. These guidelines should facilitate development and integration of cybersecurity into a comprehensive DT&E strategy that can be documented in the TEMP.

The cybersecurity DT&E process consists of four steps:

- Understand cybersecurity requirements.
- Characterize the cyberattack surface.
- Understand the cybersecurity kill chain.
- Cybersecurity DT&E.

In this model, requirements and testing bookend two important cybersecurity constructs: the *attack surface* and the *kill chain*. The attack surface generally describes the avenues by which a potential adversary may gain access to the system or data, and the kill chain generally describes what the adversary may be able to do if access is achieved—such as monitoring data exchanges, escalating privileges or embedding malicious software. Step 1 is a detailed analysis of documented requirements; these typically are *specified* tasks affecting system design. However, there are additional requirements that may not be documented formally. Step 2 considers the *implied* cybersecurity requirements necessary to reduce the overall attack surface. Step 3 identifies *essential* tasks necessary to reduce kill chain effects and ensure resilience in support of mission accomplishment in the contested cyberspace domain.

The concept of specified, implied, and essential tasks is analogous to the mission analysis in the military decision-making process (see Joint Pub 5.0). Step 4 executes cybersecurity DT&E to identify residual vulnerabilities so the developer and user can implement corrective actions before proceeding to production and deployment. A dedicated cybersecurity test event, such as testing in a cyber range, may be necessary to overcome limitations to testing on the live network.

The following paragraphs describe each step in the cybersecurity DT&E process.

Step 1: Understand Cybersecurity Requirements

This step is an analysis of system documentation to understand cybersecurity requirements. Chief developmental testers and lead DT&E organizations should examine thoroughly



system documents, including the relevant JCIDS capabilities document, program protection plan (PPP), information support plan (ISP), system threat assessment report (STAR), and others, to identify specified cybersecurity requirements. The purpose of the requirements review is to

- Identify cybersecurity requirements.
- Identify cyber threats to be emulated in test. For example, the January 2013 Defense Science Board report, “Resilient Military Systems and the Advanced Cyber Threat,” describes the cyber threat in three levels of increasing sophistication divided into six tiers (<http://www.acq.osd.mil/dsb/reports/ResilientMilitarySystems.CyberThreat.pdf>).
- Identify mission assurance category (MAC) and confidentiality level (CL) or risk category.
- Develop initial plan to integrate cybersecurity into overall DT&E strategy.
- Identify cybersecurity test organization(s), including:
 - DIACAP certifying authority/RMF security controls assessor.
 - **Blue Team.** During DT&E, the Blue Team may be a government organization or contractor equivalent. A Blue Team is a “group of individuals that conduct operational network vulnerability evaluations and provide mitigation techniques to customers who have a need for an independent technical review of their network security posture. The Blue Team identifies security threats and risks in the operating environment, and, in cooperation with the customer, analyzes the network environment and its current state of security readiness. Based on the Blue Team findings and expertise, they provide recommendations that integrate into an overall community security solution to increase the customer’s cybersecurity

readiness posture. Oftentimes a Blue Team is employed by itself or prior to a Red Team employment to ensure that the customer's networks are as secure as possible before having the Red Team test the systems." (IA Glossary, NIST CNSSI 4009).

- **Red Team.** During DT&E, the Red Team may be a National Security Agency (NSA)-certified government organization or contractor equivalent. A Red Team is "a group of people authorized and organized to emulate a potential adversary's attack or exploitation capabilities against an enterprise's security posture. The Red Team's objective is to improve enterprise information assurance by demonstrating the impacts of successful attacks and by demonstrating what works for the defenders (i.e., the Blue Team) in an operational environment." (IA Glossary, NIST CNSSI 4009)
- Identify necessary cybersecurity DT&E resources.
 - Cyber range resources (e.g., NCR). During DT&E, the program may use a contractor-provided cyber range.
 - Modeling and simulation (M&S) tools for cybersecurity.

Step 2: Characterize the Cyber Attack Surface

The objective of Step 2 is to characterize the cyber attack surface to identify additional implied cybersecurity requirements. The attack surface may be defined as the system's exposure to reachable and exploitable vulnerabilities. System interfaces collectively contribute to the overall attack surface; in other words, any connection, data exchange, service, removable media, etc., may expose the system to potential threat access. Programs should not assume delivered support components (such as government-furnished equipment) are risk free; the system is only as secure as its weakest link. Chief developmental testers and lead DT&E organizations should accomplish the following during Step 2:

- Examine system architecture products (e.g., SV-1, SV-6) to identify interfacing systems, services, and data exchanges that may expose the system to potential threat exploits.
- Examine system Concept of Operations to understand roles and responsibilities of system operators, administrators, and the computer network defense service provider (CNDSP).
- Identify host environment provisions for system protection, monitoring, access control, system updates, etc.
- Analyze the attack surface to determine likely avenues of cyber attack.
- Determine system exposure to common vulnerabilities (examples in sidebar on Page 37).
- Evaluate early DIACAP/RMF and other security test artifacts.
- Identify test opportunities where representative systems and services will be available to conduct cybersecurity testing in a system-of-systems context (such as Joint Interoperability Test Command testing).
- Integrate DIACAP/RMF security controls assessment activities into unit testing, functional testing, etc.

- Refine the plan for integrating cybersecurity into DT&E activities.

Step 3: Understand the Cybersecurity Kill Chain

Step 3 focuses on identifying potential kill chain activities and closing vulnerabilities. Understanding how the cyber adversary may obtain access (the attack surface) is critical to determine potential actions the adversary may take. The cybersecurity kill chain is a sequence of actions used by a threat to execute a cyber attack. While there are variations of the kill chain, the typical stages include reconnoiter, weaponize, deliver, exploit, control, execute and maintain. Step 3 involves an analysis of potential kill chain activities to identify essential cybersecurity requirements necessary to improve resilience in the contested cyber domain. During this step, a Blue Team conducts cybersecurity testing during system integration tests and provides the program a vulnerability assessment of the system and its interfaces for corrective action. Chief developmental testers and lead DT&E organizations should accomplish the following during Step 3:

- For each attack surface vulnerability, determine likely kill chain activities.
 - Determine how the system is designed to respond to kill chain activities.
- Evaluate early DIACAP/RMF artifacts and identify vulnerabilities by DIACAP severity category. DoDI 8510.01 specifies severity categories as category (CAT) I, CAT II and CAT III.
 - CAT I weaknesses shall be corrected before an authorization to operate (ATO) is granted.
 - CAT II weaknesses shall be corrected or satisfactorily mitigated before an ATO can be granted.
 - CAT III weaknesses will not prevent an ATO from being granted if the DAA accepts the risk associated with the weaknesses.
- Using a Blue Team, perform a vulnerability assessment to determine the most likely threat exploits.
 - Scan systems and interfaces to determine potential vulnerabilities.
 - Include or emulate the CNDSP.
- Implement Blue Team-recommended corrective actions.
- Finalize the plan for Step 4 cybersecurity DT&E.

The results of Step 2 and Step 3 may help assign responsibility for corrective actions to the materiel developer, user, host environment or CNDSP.

Step 4: Cybersecurity DT&E

During Step 4, programs execute cybersecurity DT&E to confirm readiness for production. Step 4 evaluates system cybersecurity in a mission context, using realistic threat exploitation techniques. A Red Team performs cybersecurity testing, which may necessitate use of a cyber range to reduce the risk of collateral damage to live networks or authoritative data sources. Chief developmental testers and lead DT&E organizations should accomplish the following during Step 4:

Common Vulnerabilities

Password Practices

- Use of default passwords
- Poor user password practices
- Passwords stored on network devices without encryption or with weak encryption
- Use of keyboard pattern password

Privileged Access

- Standard user credentials with administrative privileges granted
- Use of shared administrator accounts
- Administrator accounts using identical UID/passwords across multiple server platforms
- Administrators using privileged accounts to access Internet Web servers

Access Control

- Use of unsecure ports and protocols (Port 80: HTTP)
- Use of prohibited ports and protocols
- Unsecure network services enabled on network devices and systems
- Anonymous File Transfer Protocol (FTP) allowed
- Lack of Access Control Lists (ACLs) implemented on border router

Computer Network Defense Service Provider (CNDSP) Monitoring and Operations

- Inadequate detection of insertion of removable media
- Host Based Security Services (HBSS) misconfiguration
- Unauthorized (rogue/malicious) devices installed on network not detected

- Use of physical intrusion devices not detected
- Unauthorized software installed on workstations not detected (HBSS)
- Misconfigured Intrusion Detection Systems (IDS)
- Data exfiltrations not detected

Workstations and Server Configurations

- Insecure configurations for hardware and software on mobile devices, laptops, workstations and servers (noncompliant remediation of known vulnerabilities)
- Unpatched server and workstation vulnerabilities (Buffer Overflow and Code Injection Vulnerabilities)
- Use of unauthorized software
- Unsecured SharePoint server
- Misconfigured services, servers and vulnerable drivers
- Network credentials, system configurations and network diagrams stored insecurely
- Web application vulnerable to Standard Query Language (SQL) injection attack (input validation vulnerability)
- Unauthorized data manipulation, due to weak data protections
- Operational information stored insecurely (no authentication or encryption used)
- Unsecured chat systems


Infrastructure

- No Wireless Intrusion Detection (WIDS) devices implemented
- Logging for infrastructure (network) devices not implemented
- Exploitation of two-way trust relationship between domains
- Physical security of critical components

- Evaluate final DIACAP/RMF artifacts:
 - Have all CAT I and CAT II vulnerabilities been resolved?
 - Is there a plan and schedule for remediating critical unresolved vulnerabilities before deploying the system?
 - If mitigation or remediation efforts have been completed, have they been tested and included in the DT evaluation report?
- Using a Red Team, attempt to exploit the attack surface and execute cyber kill chain activities.
 - Test in a cyber range if necessary. During DT&E, the program may use a contractor-provided Red Team and cyber range.
 - Include or emulate the CNDSP.
 - Include typical users if available.
 - Identify exploitable threat vectors and vulnerabilities.
- Analyze results to determine impact to mission.
 - Assess resilience to cyber attack effects.
- Recommend corrective actions to improve resilience.
 - May include nonmateriel solutions, such as tactics, techniques, procedures (TTP) and recommendations to the CNDSP.

updates and incremental development activities that deliver new features on a recurring basis that may necessitate follow-on analysis and cybersecurity DT&E.

Summary

Developmental test and evaluation helps programs set the conditions for improved production readiness and are essential to achieving the objectives of Better Buying Power and deploying improved capability to our warfighters in an effective and timely manner. For capabilities that operate in or exchange data through the cyberspace domain, developmental testers must have robust test methodologies and infrastructure to ensure these systems are prepared to support operations in the presence of cyber attack. The *Guidelines for Cybersecurity DT&E* and the National Cyber Range assist programs in developing and executing robust cybersecurity DT&E with the objective of improving the resilience of network-enabled military capabilities. By understanding the requirements, attack surface, and kill chain, developmental testers can identify the right set of metrics and design a robust cybersecurity DT&E strategy that will provide decision makers essential information and reduce the potential for problem discovery when it is too late to fix and a development problem becomes a warfighter problem. 

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Cybersecurity DT&E may be an iterative process. Chief developmental testers and lead DT&E organizations should be cognizant of configuration changes, software and hardware



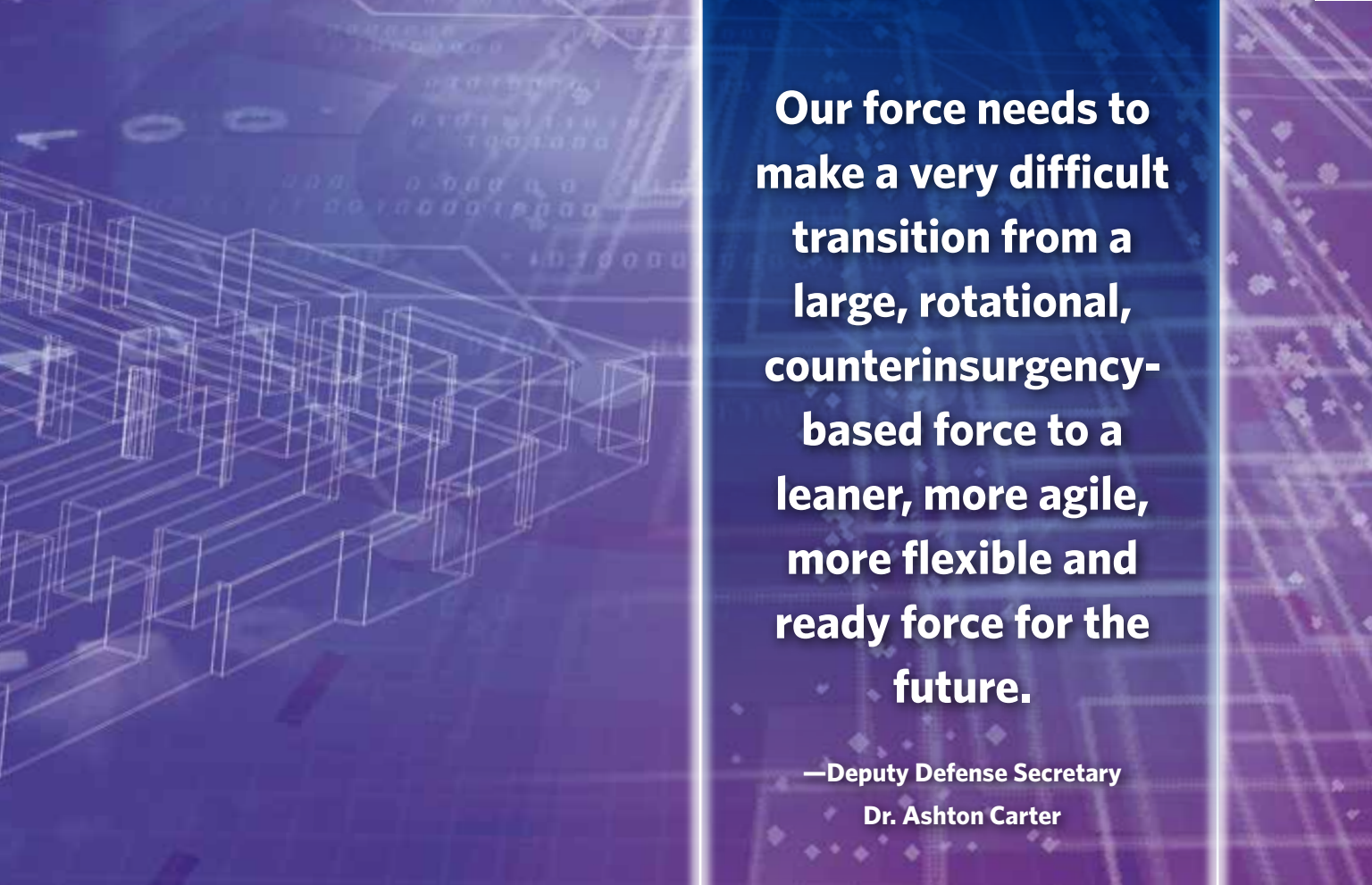
Digital Pentagon

Pete Modigliani

The time has come for the Pentagon to retire its Industrial Age management model and invent a radically new approach for the Digital Age. The Department of Defense (DoD) faces an increasingly complex operational environment at a time of decreasing defense budgets. The DoD would yield better results if it harnessed its strategic initiatives to enabling innovation instead of strict cost-cutting measures. The enterprise that more than 40 years ago helped invent the Internet for research and development collaboration must leverage the Web as a platform to network its acquisition workforce.

Rigid command and control hierarchies must transition to a more dynamic, networked decision-making model. Bureaucratic policies, processes and culture must be replaced with an operating model that is focused on organizing collective knowledge. Defense acquisitions in the digital era must be designed for an agile, innovative and

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Our force needs to make a very difficult transition from a large, rotational, counterinsurgency-based force to a leaner, more agile, more flexible and ready force for the future.

**—Deputy Defense Secretary
Dr. Ashton Carter**

collaborative environment. Rapidly advancing digital technologies, collective intelligence and organizational innovations can unleash a remarkable transformation toward a Digital Pentagon.

Rethinking DoD's Oversight Model

While a rigid command and control hierarchy may be the best approach for commanding troops on the battlefield, it is a fundamentally flawed model for leading knowledge workers in the 21st century. The traditional top-down directed management style cannot keep pace with the dynamic and changing environment in operations, business and technology. Hierarchical organization charts should make way for dynamic network models, aligning the right expertise to mission objectives, often via self-organizing, cross-functional teams. Instead of adherence to the growing number of policies and directives, leadership must focus on guiding change and fostering innovation.

The controlling mindset of many DoD executives drives the development and coordination of vast amounts of documents and a gauntlet of reviews to get an authoritative decision every step of the way. The more important or risky a program or initiative, the more oversight it receives. This approach only increases cost, schedule and risk, which is counter to the agile, rapid and cost-

effective DoD objectives. The DoD should rethink its control model and consider the old adage, "If you love it, set it free." Even Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall wants to get the Office of the Secretary of Defense out of the business of managing programs. Senior leaders should focus on enterprise strategies and architectures. Decision-making authorities of individual programs should be delegated to empowered and accountable program executive officers. Leaders in the Digital Age guide active collaboration, learning and self-organizing teams to deliver solutions.

In a Digital Pentagon, executives establish processes, resources and a culture for innovation. Instead of relying on many tiers of oversight councils and governing boards to gain wisdom, knowledge is diffused across the enterprise. Coordination will be less focused on reviewing documents and more on aligning the right expertise to help program managers be successful. A networked model that fosters mass collaboration will manage the enterprise standards, interdependencies and collective learning.

Policies, processes and reviews intended to avoid repeating failures will replicate success. Identifying and sharing what went right is more beneficial than

documenting what went wrong. Adversarial relationships across the enterprise will decline as a collaborative, integrated and networked culture emerges. The acquisition workforce will shift its attention from delivering documents to the hierarchy to delivering innovative capabilities to users in a complex, dynamic operational environment.

Headquarters staffs in the Digital Pentagon focus less on ensuring policy compliance and more on providing thought leadership as centers of excellence for their functional area. In their oversight role, senior officials reviewed dozens of programs, gaining valuable insight into what works. Now they actively share that knowledge with the acquisition community by posting best practices and lessons learned to websites and enterprise knowledge repositories. Success is replicated by analyzing the most successful programs and identifying the leading factors for others to model. Communicating elements of successful program strategies and practices enables the workforce members to understand and apply these elements to their programs early in the processes.

In a Digital Pentagon, many oversight reviews are replaced with peer reviews where acquisition professionals in other program offices review program strategies. Peer reviews provide the program office rapid, unbiased feedback from others who are going through the same processes and tackling similar issues. This approach also provides reviewers keen insight that they can apply to their programs and strengthens their professional development. Coordinating strategies with other programs improves interoperability and shapes an enterprise-wide view. Peer reviews can include those in other Services or agencies to offer a unique perspective and strengthen inter-Service partnerships.

Knowledge Management

The Defense Acquisition Workforce includes more than 150,000 civilian and military knowledge workers. In addition, the DoD employs more than 200,000 contractors at a \$100 billion annual cost for knowledge-based services in engineering, program management, logistics and other areas. Given this vast knowledge workforce, the DoD needs an enterprise-wide knowledge-management strategy. It requires a robust knowledge platform to capture, share and collaborate on the complex acquisition environment. The Defense Acquisition University's set of tools can serve as the foundation for an enterprise platform. Doing so will require an investment and redesign to effectively capture, search and share acquisition knowledge.

Transitioning from a tightly controlled policy and academic environment to an open, collaborative platform like Wikipedia is necessary for managing the vast amount of content. Empower the 350,000 knowledge workers to actively contribute and collaborate. In addition, free the acquisition policies from static PDF files to a dynamic Web of pages and wikis linking the complex concepts online. Rapidly integrate additions and changes into the policy network with trace-

ability and notification alerts. To do this, the DoD needs an Acquisition Knowledge Management Directorate within the Pentagon to develop powerful enterprise tools and strategies. It would network the acquisition knowledge workers and improve leadership's implementation of its vision, policies and initiatives.

A similar enterprise acquisition platform is needed to manage the thousands of defense acquisition programs effectively and efficiently. Program information pulled from the countless program documents, reports and metrics databases are integrated into an enterprise knowledge repository. Each acquisition program maintains a Wikipedia-like page as the single authoritative source of information on the program. Program strategies can be developed collaboratively and approved via wiki libraries, streamlining processes and improving data connections and stakeholder engagement. Stakeholders across a program's community should have central online platforms to collaborate on the program's strategies, status and issues. Portfolio managers can use IT platforms to oversee their suite of programs by aligning budgets, dependencies and strategies to strategic outcomes. The DoD can break from the static reports to more dynamic tools that monitor progress, issues and opportunities. Leveraging an enterprise knowledge repository enables the acquisition workforce to be smarter, more engaged and innovative. These tools enable new connections of people and information, advanced big data analytics and opportunities to rapidly deliver capabilities at reduced costs.

Fostering Collaboration

Kendall published an article on "The Optimal Program Structure" in the July-August 2012 issue of *Defense AT&L*. He said he wants acquisition leaders to think first, not simply adopt the school solution to program structures. Because there is no optimal solution, Kendall poses a dozen thought-provoking questions to consider when structuring a program.

What if the article were posted as a blog on his website? Discussion could occur among the defense acquisition community members, who could comment and offer additional factors. While no single optimal structure is available for all programs, Kendall could challenge the community to submit potential program structures and supporting information. Very quickly, a few dozen alternatives to the school solution would be available to reference and discuss the merits and perils.

Enabling acquisition professionals to build on these ideas will generate innovative solutions. Such dynamic collaboration cannot happen with a static PDF file. The DoD needs a platform of collaborative, Web-based tools to bring the knowledge, experience and ideas of the more than 350,000 acquisition workforce to create extraordinary opportunities. Beyond IT tools, a collaborative culture is needed that encourages sharing knowledge, program status and draft ideas integrated throughout the enterprise.

Dynamic Organization

The greatest challenge in organizational changes isn't learning the new practices, but unlearning the legacy models. While the DoD frets about the frequent turnover of political appointees and program managers, it should remain vigilant about people entrenched in key headquarters staff positions. Maintaining a steady pipeline of fresh talent and ideas in organizations fosters an environment for thought leaders to emerge. *Innovation rarely occurs from someone who has been in the same job for a decade.* The DoD should review those who have been in a key position for more than 5 years and develop transition strategies to maintain a vibrant enterprise.

The Government Accountability Office reported that 30 percent of the DoD civilian workforce and 90 percent of its senior leader workforce will be eligible to retire by 2015. Transformation to a 21st-century model will take shape as digital immigrants and natives increasingly assume positions of responsibility. This is not a culture war between generations, but a balance of experienced veterans and tech-savvy collaborative thinkers. Effectively recruiting, integrating and retaining the best and brightest of the digital generation is important to transforming the enterprise.

A Digital Pentagon would not be structured around traditional organization charts, but by a more dynamic network model. A home organization would still exist, but a significant portion of the work would occur via projects or self-forming teams. Instead of attending meetings with people who represent their organizations' interests, teams will assemble to tackle specific outcomes. Membership will fluctuate, based on the skills required, expertise available and project timelines. The Digital Pentagon will be organized for innovation with work dynamically linked and widely collaborated, instead of bureaucratically controlled. People will be given the opportunity to contribute their knowledge, ideas and passion to create exciting new enterprise solutions.

Agile Acquisitions

In this challenging global security environment, it is increasingly critical to provide our warfighters with cutting-edge, unmanned, cyber and intelligence capabilities. The DoD's emerging 21st-century primary missions include counterterrorism, irregular warfare and cyber warfare. Success in these missions requires an agile acquisition framework. Over the past 2 decades, our major weapon systems have become larger and more complex. This has resulted in significantly higher costs, longer schedules and reduced quantities, ultimately increasing acquisition, budget and operational risk. DoD must reverse this trend by developing many smaller systems more frequently as networked elements of an integrated enterprise.


Many of the DoD's most successful programs over the past decade operated outside the traditional acquisition framework to deliver warfighter capabilities rapidly. Urgent warfighter needs, short operational timelines, senior leadership attention and sufficient funding were common elements. These

programs did not spend years defining requirements; analyzing alternatives; developing detailed cost estimates, acquisition and test strategies; and obtaining approval from dozens of organizations. These programs broke from the model that focused on a large-scale \$10 billion weapon system with a 10- to 15-year schedule to delivery and 30- to 50-year life-span. MC-12 Liberty aircraft integrated an existing radar suite with a commercial aircraft and delivered a critical intelligence, surveillance and reconnaissance asset to theater in less than a year for \$17 million each. More than 20,000 Mine Resistant Ambush Protected vehicles were developed rapidly and delivered to theater, reducing improvised explosive device casualties by up to 90 percent. Cyber capabilities developed in weeks and months can achieve strategic objectives without deploying large ground forces or dropping thousands of bombs. Digital technology is advancing innovations at breathtaking speeds.

Wikispeed leveraged agile software development methods to develop an innovative 100-miles-per-gallon car in 3 months. Wikispeed broke from General Motor's and Toyota's traditional manufacturing model, entailing 10-year development cycles and billion-dollar capital investments. Wikispeed used a modular approach with 1-week sprints to iterate its car, continually re-evaluating and inventing the highest-priority features. This approach enabled Wikispeed to be more responsive to customer changes, integrate current technologies and rapidly improve system performance. By leveraging distributed, collaborative teams, Wikispeed was highly productive, knowledgeable and motivated.

The DoD enterprise collaborative platforms and networks will enable a tighter integration of the Joint warfighter and the acquisition community and increase public/private collaboration. A dynamic requirements model can evolve with operations, budgets and technology. Information systems that leverage automated tools enable rapid testing and continual cybersecurity assessments. Capabilities are developed faster, are cheaper and are more integrated when building to an enterprise architecture and leveraging common platforms. Acquisitions in a Digital Pentagon will be structured from a dynamic network model foundation to harness the accelerated pace of technological change and foster an *innovation* environment.

Summary

Achieving an agile, innovative and technologically advanced force for the future will require a radical new approach to the Pentagon's structure, operations and culture. New investments in digital platforms will harness the collective knowledge of the enterprise to unleash innovations and generate substantial cost efficiencies. Recruiting and integrating the digital generation into a dynamic, networked workforce will be critical. This new, agile way of working makes decision making easier, freeing the organization of bureaucracy and institutional paralysis. Digital technologies will underpin DoD processes, policies and strategies to position the Pentagon for tremendous opportunities in the 21st century. 

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The Virtual PM

Robert L. Weinhold



The era of the Virtual PM (project manager) is alive and well! In an age of cellphones, Blackberries, e-mail, conference calls, flextime and flex place, the PM no longer has the luxury of always being able to schedule face-to-face, weekly meetings with his or her team. The current work environment requires the PM to be even more adaptable, flexible and available virtually. Decisions no longer can be made on paper or staffed through layers of management; instead they have to be made out of sight and in real time from wherever the PM is located, and whenever the situation calls for it.

For some of us older PMs, it has been quite an adjustment, but in many ways a very welcome one, depending on the circumstances. I find myself in the role of senior acquisition specialist supporting an Army PM who is very mobile and constantly on the move. Fortunately, I am not required (nor do I chose) to be a “road warrior,” so I can support the project team from home base while the PM takes care of business outside the office environs as the project and schedule require.

The keys to success in this new virtual environment, I believe, are centered on the following five traditional management principles.

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1 Communication. In the Virtual PM environment, communication may be the principal key to the success or failure of a program. The communication network has to be well wired and constantly engaged among all of the team members. Project status has to be continuously communicated, updated, understood and accurately reported across the team as well as to management, stakeholders and decision makers. Any weaknesses in the communication network have to be corrected immediately and the flow of project information has to be properly directed with task actions assigned, understood and deadlines established that are realistic and completed on time. Team members must have the appropriate tools to communicate and must be constantly in the loop regarding changes in program direction, organizational policy, and project priorities.

Too many organizations are still “communication challenged” as they practice one-on-one conversations among team members rather than exercising the team

to share information among all team members. This is a most inefficient and ineffective way to manage any program and can create confusion among team members, as one-on-one conversations more often than not result in different interpretations of the same information, duplication of effort and the need to conduct even more dialogue to clarify the misunderstandings created by multiple two-person discussions on the same subject. It is a hazard for all types of information flow whether from the top down, the bottom up, or across the organization. While such one-on-one communications are certainly necessary for the execution of specific tasks, nothing can replace a team meeting of all members to present a corporate vision, clarify organizational goals and gain a common understanding of the priorities of the organization and the team. Of course, there also is the mundane topic of reviewing action items, discussing travel plans, and touching on the current “hot topics.” These are some of the necessary, routine activities that a PM just has to do in his/her role as a leader and representative of the senior management of the organization.

One cautionary note in the Virtual PM environment is necessary regarding the use of electronic mail messaging: While the benefits of e-mail are many, the downside can be the downfall of the PM. How many times have you, the PM, so fallen behind on your e-mail messages that you find yourself spending half a morning or longer just working through a backlog? This, of course, is not an efficient use of a PM's time, although often it is understandably unavoidable. It may be necessary for the PM to establish some basic rules about the use of e-mail, such as limiting the amount of e-mails or

edly. This experience can vary widely depending on the personality and biases of the individual. While some people are pretty "thin skinned" and may resent any kind of reminder, others are more than happy to be approached for status or general information and welcome the interaction. The real challenge comes with the former people who, unfortunately, may have to be handled with kid gloves. This situation could present an even greater challenge for the Virtual PM if he or she has to intervene from afar. This is where the PM will be ahead of the game if his team members have been instructed

The bottom line is that there is absolutely too much work for one or two members of the team to accomplish efficiently. It takes the entire team working under the delegation of the PM and/or deputy PM toward the completion of the corporate mission.

restricting them to only urgent messages during specific hours of the workday. Another caution regarding e-mail traffic is that unexpected blocking of outgoing emails because you exceeded the maximum capacity for record storage on your server. While it may be a simple matter of e-mail discipline, it can present an untimely interruption when the PM or a team member is trying to catch up on some necessary e-mail message responses or maintenance.

2 Follow-up. Although follow-up falls under communication, it deserves separate consideration due to the critical need for follow-up on the many actions generated by the Virtual PM and other virtual team members. Following up generally implies there is a system or database that contains the details of the follow-up actions. Someone on the team, therefore, must be assigned to track the many actions communicated from the PM to the team members, and among the team members, so that the right people make timely and complete responses with the right information to the right audience. Follow-up may entail two to four or more times to revisit a particular action—and while it may seem like overkill, in my experience there's no such thing as "too many times" to follow up. If an action is important enough to assign, it is important enough to follow up as many times as possible until it is completed. It only takes one action left unattended that could result in dire consequences to the program, so the adage "better safe than sorry" is more than a cliché in this case.

A delicate balance is necessary between constant follow-up and the "blowback" that can occur when people feel they are being badgered rather than just asked for something repeat-

and/or trained adequately in dealing with the proverbial difficult employee. The PM should consider investing some time in this area. It could result in big dividends down the road when his team members have to handle such situations on their own. It will take some of the stress out of the PM's job and save everyone on the team some unnecessary work and possibly grief.

3 Delegation. No man (or woman) is an island. Truer words were never spoken in the virtual environment. I learned a long time ago, long before the concept of a virtual environment, that no PM, supervisor, manager or leader can succeed without delegating to some degree. It can be a difficult concept, especially for those control types who just can't give up the simplest of tasks for any number of reasons, from lack of trust in subordinates to an inherent feeling that only the PM can do a task the way it needs to be done. To operate successfully in today's chaotic and fast-paced environment, the virtual manager must learn the art of delegation. Certainly, delegation does not mean abdication. Rather, it means assigning a task, communicating an understanding of that task and periodically checking on the progress of that task until it is complete. It requires, again, communication but demands a level of trust in other members of the team. The bottom line is that there is absolutely too much work for one or two members of the team to accomplish efficiently. It takes the entire team working under the delegation of the PM and/or deputy PM toward the completion of the corporate mission. This means everyone on the team has a stake in his or her individual success as well as the success of the PM and the overall success of the organization.

Delegation has become something of a lost art, yet it can save the Virtual PM a great deal of time and contribute immensely to the efficiency and effectiveness of the team. The Virtual PM actually can delegate from afar, which means he doesn't have to be a homesteader to engage in this vital activity. "Letting go" is possibly one of the most difficult management concepts in the PM's toolbox, but also possibly one of the most important. It can mean the difference between work getting done on time and work not getting done at all. It also can save precious work hours and increase the productivity of the organization by orders of magnitude. Finally, it can improve the team members' abilities to manage themselves through increased responsibilities and the development of an increased level of trust demonstrated by the PM for his subordinates. Mistakes will be made along the way, but the Virtual PM must be willing to accept these mistakes and understand that the gains realized through delegation will, generally, far outweigh any damages from the mistakes of the team members.

4 Visibility. Another subset of communication is visibility of the team members and of the team's progress and success. The question and the challenge is how to make things "visible" in this virtual environment. The old-fashioned way of achieving visibility (face to face) is not always feasible. Aligning all the team members' schedules to the PM's schedule is rarely possible, particularly when there is a geographic separation of some of the members, the virtual environment notwithstanding. The best way to ensure some face time is to plan periodic (quarterly or monthly, if possible) team meetings at a designated location either at or away from

situation, but one possibility was to bring these two principal team members together for face-to-face interchanges with the team members. These were awkward at first, but after the PM and CO realized the benefits of such meetings, they embraced them and actually started to have meetings twice a week. The build-up to the release of a major solicitation was, in large part, driving the frequency of these meetings; nevertheless, they accomplished what was needed by providing face time to address ongoing issues on a real-time basis. This was somewhat of an epiphany for everyone and, as I look back on the experience, I am convinced of the absolute necessity of injecting visibility into team activities, notwithstanding the very difficult schedule challenges. At the end of the day, a picture really is worth a thousand words and a 1-hour face-to-face meeting is worth a thousand visual images. Accordingly, the Virtual PM must somehow make time available periodically to be visible to his staff and make his staff members visible to each other.

5 Roles and Responsibilities. One of the most basic, yet least practiced, concepts has become the need for defining, stating and clarifying roles and responsibilities. The idea that any organization can bring employees into a work setting and not clearly articulate their roles and responsibilities violates basic management principles at many levels. My experience in government and management consulting has demonstrated that those organizations that do a good job in this area reap the benefits of all the previous concepts of communication, visibility, delegation and follow-up simply because people understand their assigned tasks. Such enlightenment leads employees to a comfort level at

The employee must clearly understand the expectations of the position and the person. The lack of such a clear understanding does a disservice to both the organization and the individual and further complicates the job of the Virtual PM.

the daily worksite. My experience as a PM has been to conduct weekly meetings limited to 1 hour, with a specific agenda and designated roles and responsibilities during that 1-hour session. Many PMs, of course, would consider this a luxury.

At the start of one of my prior work assignments in support of a government PM, I discovered that the PM did not conduct team meetings with the entire team, including the contracting officer (CO). Most exchanges between the PM and CO were conducted over the phone and it created some angst between the two that had been festering over a long time. Two strong personalities were involved, which is always a difficult


which they know exactly where they fit into the organization and what management's expectations are, merely because roles and responsibilities were stated clearly from the outset.

This is not "rocket science," although a rocket scientist may say to a prospective employee that his role is not "defense acquisition." I guess it's all relative, depending on where you sit (or stand). Many organizations seem to take this area for granted and assume that because a person was hired for a particular job that person both knows and understands his or her roles and responsibilities. In fact, this meeting of the minds may never have occurred—and situations do change

over time. I have had several experiences on this subject that led to a less than clear understanding of what my roles and responsibilities as a PM were supposed to be.

During one assignment, I was hired for a specific position on a pending contract award. As it turned out, the company didn't get the contract so it had to make some key decisions regarding what to do with me and several others hired for that particular contract. Unfortunately, the position description never was defined fully for the original position that did not materialize, so it turned out to be a moot point. However, the subsequent assignments also were not described and I became somewhat of a jack-of-all-trades, filling in where I was needed. It was a tenuous situation, at best, and created some uncertainty for me as a new employee as well as for my immediate superior. Eventually, I settled into a position as a contracts specialist, not as the PM I had hoped to be, but it did provide long-term and important work with the federal government. Nonetheless, the roles and responsibilities never were documented or made final, so there always was a sense of not knowing where I truly fit into the organization.

The lesson learned is that roles and responsibilities should not be taken lightly or left to chance. It is absolutely critical that each employee knows and understands from the beginning what his or her specific role in the organization is, and that his or her responsibilities are defined in sufficient detail that both the employer and the employee clearly understand the expectations of the position and the person. The lack of such a clear understanding does a disservice to both the organization and the individual and further complicates the job of the Virtual PM, who has enough to manage.

In conclusion, Virtual PMs face challenges unlike any they have had to face in the recent past. The dynamics of the economy, the workplace and world events demand that the Virtual PM concentrate on some of the basic, time-tested and successful management principles. While the five foregoing concepts may portray a stark grasp of the obvious, they have certainly demonstrated to me over more than 35 years of experience in DoD acquisition and program management that the payback can exceed anyone's expectations. While we desperately need the technology and electronic communication tools to survive and continually maintain the advantage in our management challenges, we should never lose sight of the basic management principles that have brought us to where we are today. Without the likes of Frederick Taylor, W. Edwards Deming, Peter Drucker, Milton Friedman and so many other pioneering visionaries in the management field, we might not have advanced to the degree of management sophistication that we have. Spending some time on the basics not only will keep us grounded in what is really important, it also will provide the edge we all need to survive in the ever-changing technological age and through the continuing evolution of the Virtual PM. 

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Stakeholder Needs and Expectations

Planning Your Agile Project and Program Metrics

William A. Broadus III

A key element in the success of any project or program is the ability to communicate progress against a baseline of cost, schedule and technical performance within and outside the team. When the expectations for communications are not understood clearly and/or are misaligned horizontally or vertically across the program, it becomes very difficult for all affected stakeholders to answer the questions, “So where are we today? Where will we be tomorrow?”

The communication of metrics can facilitate trust, illustrate progress, identify issues and highlight the effectiveness of implemented process improvements. To achieve these benefits, measuring and reporting should be at the heart of every project including those based upon Agile approaches. However, projects or programs with Agile content often require their own set of tailored metrics and traditional assessments that may not be usable for the entire stakeholder set. This particular point is an important planning consideration in the Department of Defense (DoD) environment where there is significant hierarchical reporting and numerous levels of multiple stakeholders, all with varying needs and expectations for performance data and information.

By their very nature, Agile metrics are available to be reported and analyzed more frequently since this approach delivers projects through small, well-vetted “sprints.” Each sprint has a goal, and the assessment of achieved

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functionality always is a conducted activity of the sprint with the user representative.

Given the increased frequency and quantity of available metrics, Agile teams need to highlight only the most vital and timely metrics. What “vital and timely” means to various stakeholders is where the real crux of planning resides: Determine the needs and expectations of performance reporting at all stakeholder levels. There is a requirement to align reporting across all levels of the government-vendor team. This requires matching the traditional DoD project monitoring methodology (focusing on tracking the performance of each work breakdown structure [WBS] work-package) to that of Agile methodology (where tracking is focused on incremental delivery of functional capability). Within DoD acquisition, we have to structure our solicitations to accommodate these different requirements during the project/program execution.

In planning performance reporting, each stakeholder group should receive only the metrics relevant to its

needs and expectations. Emerging best practices within the software development community have identified a potential set of criteria for establishing metric requirements for various stakeholder groups working on Agile programs:

- Relevance to their decision-making affecting the project/program
- Sufficiency of detail to be usable
- Availability (e.g., daily, for an iteration or release, or a milestone/gateway ... etc.) for their roles and responsibilities

To be effective, a proposed model for tailoring Agile metrics would be based around commonly definable stakeholder groups. Within DoD, a potential set of groups could include direct team members, senior sponsors/leaders, organizational stakeholders and external stakeholders/users. Understanding the composition of these groups, and establishing a set of specific expectations each would have for performance metrics would promote development of specific information

requirements that can be articulated within the body of a contractual vehicle.

Stakeholder Needs—Team Members

More than any other audience, team members need highly specific and detailed information because they have the greatest immediate use for such data.

This particular group is involved in the daily efforts associated with the planning, development, testing and delivery of software to support functional capability requirements. Therefore, this group needs highly specific and detailed information that is immediately available for use. These data must quickly describe what is happening with the project (at the sprint level), provide a means to diagnose issues, identify areas for improvement and provide positive incentives for the team. The intent is to select only the best metrics that give teams the detail they need without overwhelming them.

Research on the evolving best practices within the Agile development community indicates that a set of performance information focused on the team member stakeholders likely would consist of the following commonly available metrics:

- **Velocity:** The number of features a team can deliver during a sprint is the principal Agile metric, as it allows the team to accurately predict and plan progress, thereby keeping projects on schedule and within budget.
- **Burn Up/Burn Down (BU/BD):** A burn-up chart shows how many features the team has promised to deliver, while a burn-down chart shows how many features it has completed. The real power of these charts to the team members is motivation. They permit team members to clearly see when they are likely to finish the project and, in comparison, to see the steady reduction of the work still to be

done. This particular metric enhances the team’s ability to answer earned value management (EVM) questions about “what value has been earned and what is left to complete.”

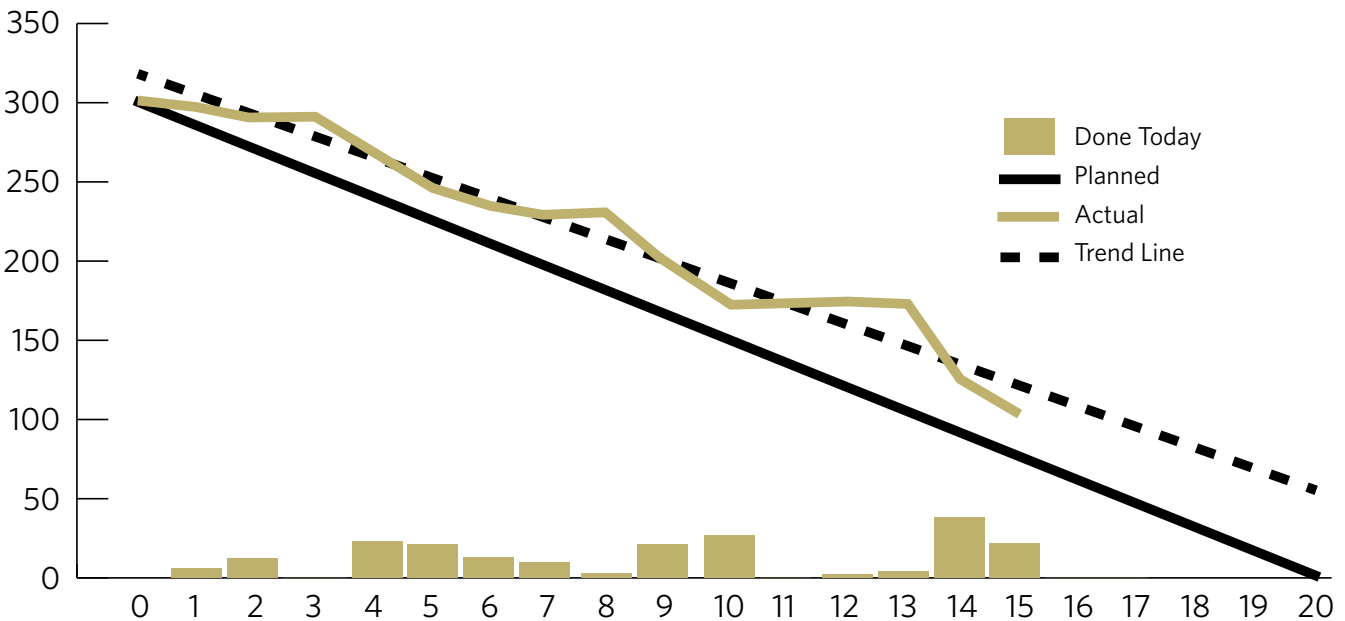
- **Running Tested Features (RTF)/Defect Density:** For all software development projects/programs, understanding defects has been a standard metric and is a completely applicable and critical quality metric in the Agile environment. RTF, a similar measurement, shows how many features in each sprint have passed acceptance tests. As with the BU/BD metric, positive data can be very motivating to the development team. In practice, Agile techniques such as “test-driven development” and “acceptance test-driven development” contribute significantly to the prevention of defects. Not introducing defects into the system in the first place will greatly reduce “defect density” when compared with the more traditional DoD software development approaches.

Stakeholder Needs—Senior Sponsors and Leadership

For senior-level leadership of both Agile and non-Agile projects, traditional metrics are still the most appealing. For these stakeholders, the strategic concerns of the project or program are chief concerns. For this group, the primary focus is understanding whether the project is on budget and schedule and going to deliver the promised performance. As a general rule, the details of issues such as defects, unless they affect the cost, schedule or capability of the software, are not important.

At this touchpoint in the DoD hierarchy of senior leaders and project team members, the real difficulty in translating metrics occurs. Agile metrics differ from traditional metrics in that they are considered “adaptive” rather than “predictive.” In a traditional waterfall project, the cost, time and desired capability are defined at initiation; therefore, the metrics emphasize planned values (the Budget Cost of Work Scheduled [BCWS])

Figure 1. Sample Burn Down Chart



from an EVM perspective). In an Agile development project, these constraints (BCWS) will evolve as a function of the quality of the software completed; the emphasis shifts to metrics focused on earning value (Budgeted Cost of Work Performed or BCWP).

In a fashion similar to the discussion of team members, research on the evolving best practices within the Agile development community indicates that a set of performance information, focused on the senior sponsors and leadership stakeholders likely would be built around the following metrics:

- **Burn Down (BD):** The senior sponsor and leader version of a burn-down report would summarize from a high level how many required performance capabilities or features have been delivered and how many remain outstanding. To facilitate this reporting, there needs to be a clear, traceable and unambiguous systems engineering discipline of “threading” the user-based requirements (Key Performance Parameters and Key System Attributes) and the buyer-based requirements (Specifications, Statement of Objectives and/or Statement of Work-related) down to the capabilities being provided with each Agile sprint.
- **Earned Business Value (EBV):** EBV is a commercial sector practice that communicates an Agile project’s progress toward delivering its expected goals. It may be adaptable to the DoD environment since it is related to similar principles that allow for the use of an EVM system. In practice, when items from the product backlog (the remaining agreed-to project performance capability yet realized) are completed, they add to the project’s EBV as a percentage of its cumulative Return on Investment (ROI). This percentage is determined for each specific capability delivered during a particular sprint. Since quality of the developed software is an Agile project’s principal objective, EBV as a metric provides senior sponsors and leadership a measure of how much value has been delivered thus far for the end user. As with the “Burn-Down” above, strong linkage between the individual “scope” of each sprint and the high-level performance of the system at the “user perspective” is critical to the value of the EBV metric.

A metric such as EBV may prove too complicated to articulate in data deliverable in your solicitation or to utilize within the DoD program environment, so an internal manipulation of performance data may be required to meet the expectations of senior sponsors and leadership.

The current DoD practice utilizes a “dashboard” that fundamentally can display what the team has

committed to, what it has accomplished so far and what it has yet to deliver.

Potentially, there are other persons affiliated with the senior sponsor and leadership groups who have an interest in a project but aren’t working directly on it. This group would include roles such as the program manager(s), Fleet liaison, resources and other functional managers. They generally will be interested in the same high-level business metrics as the senior sponsors and leadership, though they often require additional details related to their specific functions.

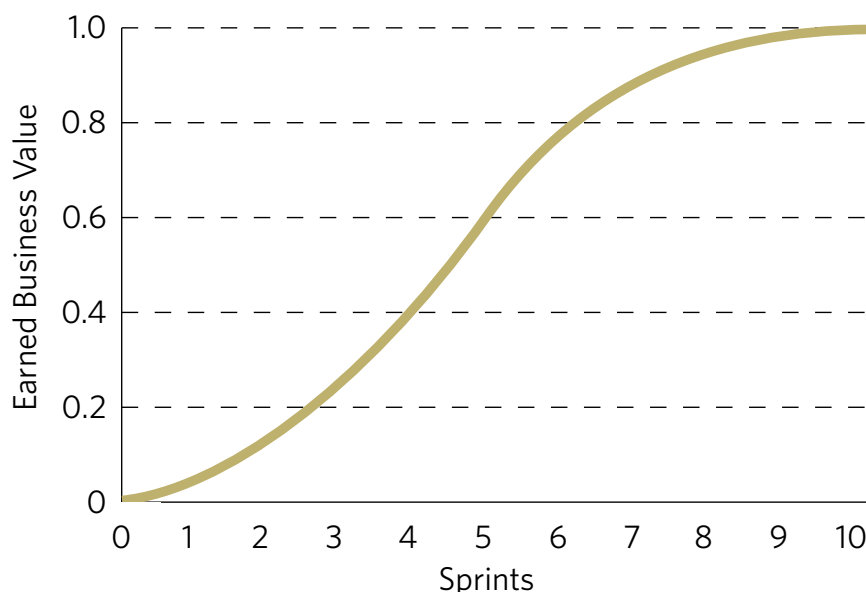
For example, the Fleet liaison team lead may need to know when a software increment or full capability will be available so the team can plan and resource the Fleet implementation with support engineers and the receiving activity. The metric of “Velocity” would not be a useful metric on its own for the liaison team but would become very relevant when accompanied by a direct detailed narrative discussion on the team’s progress.

Facilitating the exchange of information such as this will be a key role of the “Agile Advocate” and “end-user representative.” These two roles, as discussed in the January-February 2013 *Defense AT&L* magazine article “The Challenges of Being Agile in DoD,” form the key bonds between the development team and outside world of the program office and other stakeholders.

Stakeholder Needs—External Stakeholders

The external stakeholders are the group that receives the greatest benefit from Agile approaches due to its improved “time to market.” In DoD, this group of stakeholders includes both the end-user in the Fleet, as well as elements within the parent service and/or at the level of the Office of the Secretary

Figure 2. Earned Business Value Example



Agile metrics differ from traditional metrics in that they are considered “adaptive” rather than “predictive.”

of Defense. If these stakeholders are funding the project, they should receive the same high-level business metrics, such as EBV, that senior sponsors and leadership get. Otherwise, as in the case of the Fleet user, the metric they will care about most will be whatever portion they get and when their “vetted capabilities need” will be delivered.

The most compelling aspect of Agile is its iterative process. Software capabilities can start showing up earlier to the Fleet user than in the traditional process. Close coordination and sound configuration management discipline are necessary to ensure that all the needed elements are in place for the user to accept these incremental capability enhancements—a clear driver for the proper set of metrics.

Take Time and Be Selective

A large array of Agile metrics is available to project managers and the stakeholders they team with. Because of the nature of Agile (i.e., an emphasis on speed), it demands that project managers choose their information tools wisely to effectively integrate with the demands of the team, sponsors, leadership and external customers.

Aligned to Agile principles, the project team should look to measure the minimum necessary to satisfy all the stakeholder requirements. DoD therefore must stipulate what performance reporting it desires at all levels and allow the development team to propose ways to meet that reporting requirement. In essence, DoD needs to consider how to focus on providing a “statement of objective for metrics” to facilitate better performance reporting.

Other Best Practices

The suggested metrics proposed in this article offer a potential foundation for discussing what information to present to stakeholders at various levels. If, however, the stakeholders on your particular program are not satisfied with your planned approach to reporting performance, best practices suggest the following strategies be considered to obtain buy-in:


- **Solicit Examples.** If your stakeholders desire more or different metrics, ask them to provide a template or report format consistent with their needs. This practice is better served prior to the award of a contract for development, when potential vendors can adjust their scope and cost estimates.

- **Promote Open Communication.** Agile is fast-paced, so offer greater visibility of the information being collected. This can satisfy those who wish to analyze the development from an independent perspective. This practice, however, can create a huge additional burden on those directly involved in the development process: having to explain terminology and the purpose of details well beyond the needs of those external to the team. Again, this is an excellent opportunity for the “Agile Advocate” to mediate between the various stakeholder elements.
- **Encourage Collaboration.** A key stakeholder seeking greater levels of information actually may be looking for greater levels of involvement. An approach espoused in the commercial sector is to make this key stakeholder a “co-owner” of the team’s product backlog (the remaining agreed-to performance capability of the project that is yet to be realized) along with the product owner. This action would ensure the stakeholder’s involvement in the “construction and grooming” of the product backlog continuously from initiation to closeout of the project.

Conclusions and Summary

Agile, while different in approach than traditional software-intensive projects and programs, still has as a central element the need for high-quality communication of cost, schedule and technical performance. The development team seeks to instill a sense of trust, illustrate its progress and facilitate the resolution of issues that affect all stakeholders, team members, senior sponsors and leadership as well as those outside the organization.

To achieve these goals, the need for metrics that are effective measures across all stakeholder levels must be accommodated in the program’s acquisition strategy. Determining what vital and timely mean at all levels is an early planning requirement if stakeholder expectations of performance reporting are to be met. This task requires cross-matching the traditional DoD WBS-based project monitoring methodology to that of an Agile incremental functional capability monitoring methodology. The desired outputs must focus on supporting decision making by delivering sufficient and relevant details in a timely fashion to leadership at all levels of the organization—a desired accomplishment in any program, let alone an Agile one.

Accomplishing the above is not always a simple and straightforward process. Obtaining the proper level of buy-in on what the various stakeholders believe is a robust set of performance metrics for an Agile-intensive project or program may necessitate the use of additional best practices. Strategies should look to include open solicitations of example templates or formats (better served prior to contract award), upfront promotion of open communications that include relying upon your “Agile Advocate” and establishing an environment of collaboration through co-ownership of key program planning throughout the development life cycle. 

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Risk in Fixed-Price Contracts

David E. Frick, DBA



Current federal policy expresses a strong preference for fixed-price contracts in federal contracting. Firm-fixed-price contracts are depicted as existing on the extreme left of the continuum of risk. As we progress through the various fixed-price flavors and into cost-type contracts, the assertion is that risk shifts from the vendor to the government. We even describe contract types on the extreme right (e.g., labor hour and time and material) as “high risk.”

While, on the surface, this assertion appears reasonable, we do ourselves and the taxpayer a disservice when we couple this belief with the assumption that there always exists goodness in shifting risk to the vendor. Cost, schedule and performance risk are only three of the characteristics of an acquisition approach that source selection authorities and the contracting

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professionals supporting them must consider in selecting vendors and the underlying contract structure.

Two of the weaknesses in the processes that lead to government contracts are a much too simplistic view of the concept of uncertainty in government contracts and the universally shared misuse of language that has evolved as a consequence of this overly simplistic view. Uncertainty is an extremely complex concept. In the absence of omniscience, efforts to predict to any useful degree of certainty what events will have an effect on your contract and whether they will occur are exercises in futility. Nonetheless, we cannot wait for things to happen. We have needs that exist today, so we act and make our best guesses about future events.

Sadly, the common practice is to consider the terms risk and uncertainty as synonymous. They are not. We call the thought processes that surround considering uncertainty “risk analysis” and the efforts to combat the potential negative effects of uncertainty “risk mitigation.” You could fill a library with the publications that use these terms in this manner. We have official publications on the topics and even statutes that prescribe how we go about risk analysis and risk mitigation. This general misuse of terms and the practice of placing all things associated with the concept of risk in one basket obfuscate the specific consequences of our actions. We fail to realize that efforts to reduce or mitigate one aspect of risk often will have undesirable effects on other aspects.

A universally accepted definition of risk and the related terms does not exist. For the purpose of this discussion, we shall adopt the terminology offered in the *Risk Management Guide for DoD Acquisition*, Sixth Edition. The *Guide* acknowledges

three flavors of risk: cost, schedule and technical performance. These three flavors correspond to the cost, schedule and performance objectives of the acquisition. What the *Guide* does not do is suggest that the three flavors of risk are interrelated. The *Guide* treats them as three separate components, each to be addressed separately. The question at hand is, “Do our efforts to reduce or mitigate one component of risk have a counterproductive effect on another?”

In the discipline of project management, the concept of the “Triple Constraint” or “Iron Triangle of Project Management” appears to be universally accepted. Any change in one of the three constraints (cost, schedule and scope) is expected to have an effect on one or both of the others. The “Iron Triangle” is a good analogy and construct for cost, schedule and technical performance risk in acquisitions. When we take action to reduce cost risk, for example, our efforts will adversely affect schedule or technical performance risk.

The firm-fixed-price structure is touted as the approach to shift (cost) risk from the government to the contractor. But is this the whole story? A firm-fixed-price contract clearly reduces price uncertainty. The government will pay the pre-negotiated price and no more, although it may pay less in the event of a termination. The prudent contractor, however, will consider the uncertainty of his final cost and adjust his final offer accordingly. The contractor who consistently assumes all of the cost risk is not likely to be in business long. Some of the cost risk must be shifted back to the government in the form of a price premium for vendors to survive. Though opinions vary, large fixed-price contracts tend to include a 10 percent to 15 percent—maybe as high as 20 percent—price premium. From the perspective of industry, this is quite reasonable: These high

Table 1. Comparison of Major Contract Types

Contract Type	Principal Risk to be Mitigated
Firm-Fixed-Price (FFP)	None. Thus, the contractor assumes all the risk.
Fixed-Price Economic Price Adjustment (FPEPA)	Unstable market prices for labor or material over the life of the contract.
Fixed-Price Incentive Firm Target (FPIF)	Moderately uncertain contract labor or material requirements.
Fixed-Price-Award-Fee (FPAF)	Risk that the user will not be fully satisfied because of judgmental acceptance criteria.
Fixed-Price Prospective Price Redetermination (FP ³ R)	Costs of performance after the first year because they cannot be estimated with confidence.
Cost-Plus-Incentive-Fee (CPIF)	Highly uncertain and speculative labor hours, labor mix and/or material requirements (and other things) necessary to perform the contract. The government assumes the risks inherent in the contract, benefiting if the actual cost is lower than the expected cost, or losing if the work cannot be completed within the expected cost of performance.
Cost-Plus-Award-Fee (CPAF)	
Cost-Plus-Fixed-Fee (CPFF)	
Cost or Cost-Sharing (C or CS)	
Time & Materials (T&M)	

Adapted from “Comparison of Major Contract Types,” Acquisition Community Connection, DAU

premiums are necessary to offset those fixed-price failures—i.e., when cost estimates are low and a contract win results in a corporate loss.

Even this premium does not account for all of the cost risk. Some of it is shifted to schedule or technical performance risk—e.g., the likelihood that the contractor will ultimately default increases. It is beyond human capability to quantify these shifts, so a totally objective business case analysis is not possible. The best we can do is to make an informed guess. We ultimately must rely on judgment. If we perceive that the value of reducing price uncertainty exceeds the requisite increase in schedule or technical performance uncertainty, then a firm-fixed-price structure is justified. However, one must be fully aware that a fixed price does not “reduce” total risk; it simply reallocates total risk among its constituent elements.

In deciding on a contract structure, we rely heavily on the experience and expertise of our contracting professionals. It is, however, unreasonable to assume that contracting officers are omniscient and experts in risk management. In the process of choosing between a fixed-price and cost type contract, many of the factors that go into the “total risk” analysis are unknown or unknowable. Furthermore, in times of diminishing budgets, it may be highly desirable to be able to reduce uncertainty about the price the government is to pay. Nonetheless, defaulting to a fixed-price structure occasionally may have undesirable consequences. DoD acquisition history is replete with examples of fixed-price failures, the most notorious examples being the C-5A Galaxy in the 1960s, the C-17 Globemaster and the A-12 Avenger in the 1980s and the KC-X of this decade. These failures all share three characteristics: They were high-dollar efforts, truly developmental in nature and involved an industry with a limited number of players.

The lessons of the first three appear to have been the impetus for the prohibition on fixed-price developmental contracts codified in the 1988 National Defense Authorization Act (NDAA). Nonetheless, a mere 2 decades later, Congress reversed itself in the 2007 NDAA, which appears to have set the environment that nurtured the difficulties facing the KC-X. History repeats itself. If nothing else, the fixed-price structure appears to have limited the number of competitors.


Cost type contract structures have undesirable characteristics—they require greater government oversight and increase government administrative costs as well as the possibility of ending up with nothing. The contracting officer must consider these factors in the decision on contract structure. However, the contracting officer also must not go blindly onto the path of fixed price without considering that a fixed price may reduce the uncertainty of the acquisition in one area but increase it in others. Referring again to the A-12, the government believed that the firm-fixed-price structure was a “safe” choice and allowed the government to hold the manufacturer’s feet to the fire. However, the fixed-price structure significantly contributed to a multibillion-dollar loss

Once you leave the commercial arena and move into the realm of nondevelopmental or developmental items or services, the line between fixed and cost type contract becomes much fuzzier.

for McDonnell Douglas and General Dynamics and decades of litigation. With the advantage of hindsight, we see that a cost type contract would likely have been the safer choice.

The decision is even more critical in an environment of emerging requirements, the dreaded requirements creep. Federal contracting again is replete with examples of changing requirements leading to change orders with cost estimates that give us pause. Sad to say, only hindsight offers the wisdom necessary to select the best contract type.

For commercial items under Federal Acquisition Regulation (FAR) Part 12, we are hard pressed to give examples where the government would not be best served by a fixed-price contract, but once you leave the commercial arena and move into the realm of nondevelopmental or developmental items or services, the line between fixed and cost type contract becomes much fuzzier. Even independent analyses by highly qualified cost analysts are only as good as the quality of our assumptions. When uncertainty is high, the right contract type is unclear. As a profession, we must document our assumptions and conduct “sensitivity analyses” of these assumptions to understand the impact of when (not if) one or more of our assumptions prove to be wrong. I would postulate that across the profession, particularly if the contemplated contract structure is fixed price, the common practice is to do neither.

There is nothing in the FAR or its supplements that prevents contracting officers from selecting the best contract type for a given acquisition, although some atypical choices may be more administratively challenging than others. This article is not a call for policy changes. It is, however, a plea for the acquisition community to accept the assertion as axiomatic that the most obvious contract type may not be the best type. Don’t blindly accept the claim that fixed-price contracts expose the government to the least risk. That assertion simply is not true. 

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Hey, got a minute? If not, you should skim this article anyway for a few tips on how to manage some everyday tasks more effectively and gain back a few of those clock ticks. If you're like me, three things that steal your time away are reading, e-mail and the cursed Smart Phone. Here are some ways I've tamed those time-eating beasts.

Reading

What's the quickest way to deal with a report or an unread book sitting on your shelf? Answer: Don't read it! Yes, don't read it. Is it really that important? Is it worth your time? If not, decide now to give yourself permission not to open it—in fact, get it off your shelf so it doesn't continue to tempt you; think of how much time you've saved.

Wood is the dean of the Defense Systems Management College at the Defense Acquisition University and also teaches for the University of Phoenix School of Advanced Studies. He is a retired naval officer and acquisition professional.

On the other hand, if you have reading you really, really need or want to do, here are some ways to read more efficiently:

For books, look for a book summary, Cliffs Notes, or Wikipedia synopsis (my favorite, because they're free!). Unless you're an English Lit major, you probably only want the key "nuggets," so let someone else slog through the tome and you can save valuable time by reading their notes.

Get an audiobook. If you commute or have other periods of mindless down time, make it useful and listen to those books you've always wanted to read but didn't have the time to. Also, many devices like iPods allow you to speed up the playback to 1.5–2 times normal speed, so you get through the book faster.

For technical books and reports, if there's an executive summary or chapter summaries, read those first and only dive into sections to get to the detail you think you need. Skim or skip the rest. If there isn't a prewritten summary, spend some time in the table of contents and really understand what's covered. Again, be selective and only dive into the sections you think you need to read.

Delegate. If you have a subordinate who would benefit from reading an entire report, have that person also write a summary for you. Or, for the "kinder, gentler" among you, have the subordinate use a highlighter pen on key passages they think you should read. Your interest will help incentivize your subordinates to more closely read and deeply understand the material, and provide you with the timesaving highlights. You also will have the benefit of a newly minted subject-matter expert with whom you can later consult and discuss the report.

E-mail

There are lots of tips for handling e-mail—far too many to cover here. I have included the top four simple tips here that have worked for me in high-volume e-mail environments.

Institute a simple but effective way to flag e-mail you send and receive. Use "ACTION:" or "INFO:" as the first word in the subject line to clearly indicate the purpose of each e-mail (you may want to use "ACTION REQUESTED:" if sending to a senior). Add "URGENT" to the above descriptors if time-critical. Always follow up an urgent e-mail with a phone call.

Rarely, if ever, use "Reply All," and make it your life's purpose to persecute your subordinates who do this to you. These can needlessly fill up an inbox.

Demand that subordinates who copy you on an e-mail include a summary clearly explaining why you need to read it. Digging out a key nugget or action in a lengthy e-mail thread can be time-consuming drudgery. Likewise, be judicious yourself, and extend the courtesy of writing a brief summary to others you copy on any e-mail. The practice is contagious.

Whipping out your phone every time it emits a horrid hip-hop riff or Beethoven prelude hurts your productivity.



Keep your Inbox empty or nearly so. If you hate creating a bunch of folders to file things, create one called "Archive" and move old inbox e-mail there. Outlook and other e-mail programs have good search capabilities to allow you to resurrect archived e-mail if you need to do so. Keeping a nearly empty inbox will get rid of distracting clutter and allow you to focus on the ones that require action.

Blackberries (or other "smart" devices)

Have you ever been in a crowded room when a cell phone chimes? It's like being at the OK Corral where everyone in the room reaches for their holster! Chimes for e-mail, text messages and routine calendar alerts break your concentration and keep you from getting the current task done. Here are two tips that may help.

Turn off e-mail notifications on your phone—permanently! You aren't Pavlov's dog, but you will behave like it if you become addicted to your "Crackberry" chime. Whipping out your phone every time it emits a horrid hip-hop riff or Beethoven prelude hurts your productivity. Check mobile e-mail when you decide the time is right, not every time your device beckons. Show that little e-critter who's really in charge!

Similarly, when you are occupied with scheduled meetings (or DAU classes!) turn off your text message chime, calendar alerts and phone ringer. It's boorish and disrespectful to interrupt a meeting or social gathering to go for your phone. Rather than risk sully your pristine reputation or derailing your train of thought, check your texts and phone messages when your meeting is complete. (If you're the really risk averse type, most phones will allow you to set up special alerts when bosses—or spouses—ring you up).

OK. That's it. I hope you picked up a useful tip or two. I won't take any more of your time. Have a productive day! &

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Writers' Guidelines in Brief

Purpose

Defense AT&L is a bimonthly magazine published by DAU Press, Defense Acquisition University, for senior military personnel, civilians, defense contractors, and defense industry professionals in program management and the acquisition, technology, and logistics workforce.

Submission Procedures

Submit articles by e-mail to datl@dau.mil. Submissions must include each author's name, mailing address, office phone number, e-mail address, and brief biographical statement. Each must also be accompanied by a copyright release.

Receipt of your submission will be acknowledged in 5 working days. You will be notified of our publication decision in 2 to 3 weeks. All decisions are final.

Deadlines

Note: If the magazine fills up before the author deadline, submissions are considered for the following issue.

Issue	Author Deadline
January-February	1 October
March-April	1 December
May-June	1 February
July-August	1 April
September-October	1 June
November-December	1 August

Audience

Defense AT&L readers are mainly acquisition professionals serving in career positions covered by the Defense Acquisition Workforce Improvement Act (DAWIA) or industry equivalent.

Style

Defense AT&L prints feature stories focusing on real people and events. The magazine seeks articles that reflect author experiences in and thoughts about acquisition rather than pages of researched information. Articles should discuss the individual's experience with problems and solutions in acquisition, contracting, logistics, or program management, or with emerging trends.

The magazine does not print academic papers; fact sheets; technical papers; white papers; or articles with footnotes, endnotes, or references. Manuscripts meeting any of those criteria are more suitable for DAU's journal, *Defense Acquisition Research Journal (ARJ)*.

Defense AT&L does not reprint from other publications. Please do not submit manuscripts that have appeared elsewhere. *Defense AT&L* does not publish endorsements of products for sale.

Length

Articles should be 1,500–2,500 words.

Format

Send submissions via e-mail as Microsoft Word attachments.

Graphics

Do not embed photographs or charts in the manuscript. Digital files of photos or graphics should be sent as e-mail attachments. **Each figure or chart must be saved as a separate file in the original software format in which it was created.**

TIF or JPEG files must have a resolution of 300 pixels per inch; enhanced resolutions are not acceptable; and images downloaded from the Web are not of adequate quality for reproduction. Detailed tables and charts are not accepted for publication because they will be illegible when reduced to fit at most one-third of a magazine page.

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